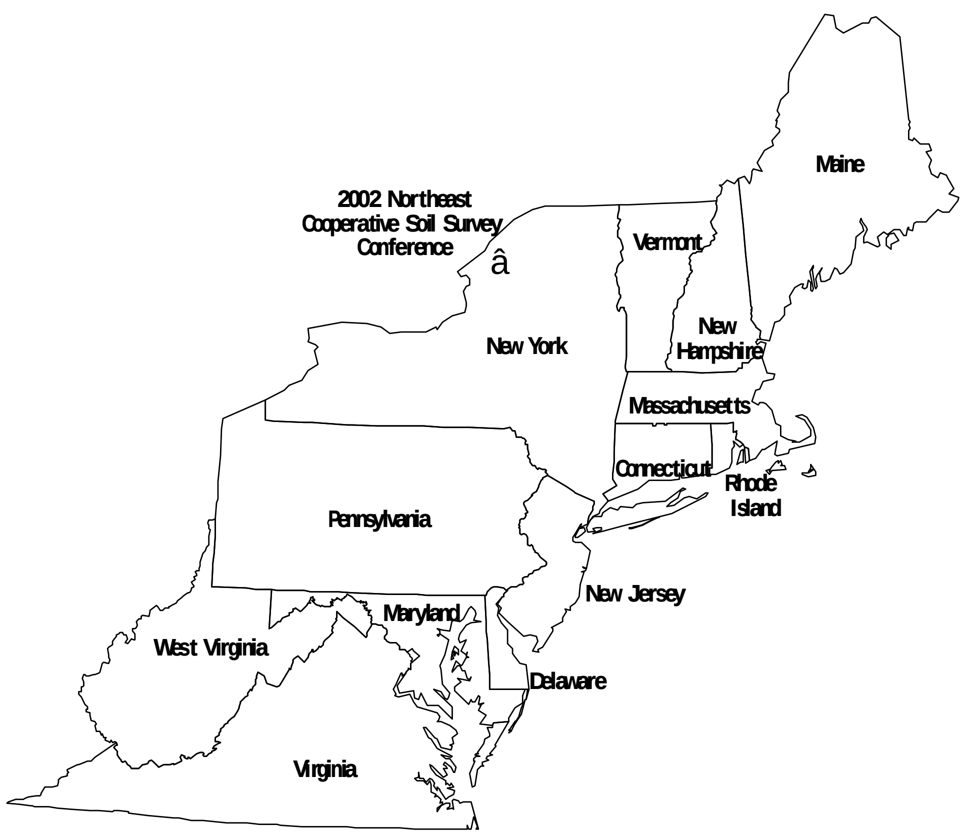
# NORTHEAST COOPERATIVE SOIL SURVEY CONFERENCE

## Proceedings

**June 24-28, 2002**
**Bonnie Castle Resort**
**Alexandria Bay, New York**



# National Cooperative Soil Survey

Northeast Regional Conference Proceedings

Alexandria Bay, New York
June 24-28, 2002

# *AGENDA*

## *Northeast Cooperative Soil Survey Conference*

*Sunday, June 23, 2002*

| | |
|---|---|
| **4:00pm – 6:00pm** | **Early Registration**<br>**Sunset Lounge** |

*Monday, June 24, 2002*

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| **7:30 am – 6:00pm** | **Mid-Atlantic and New England Hydric Soils Committees Field Tour** |
| **9:00 am – 12:00pm** | **Registration**<br>**Sunset Lounge** |

**--------------Steve DeGloria, Moderator-----------------**
**Cornell University, Ithaca, New York**

| | |
|---|---|
| **1:00pm – 1:15pm** | **Welcome to New York**<br>**Tyrone Goddard, State Soil Scientist**<br>**USDA, Natural Resources Conservation Service, New York** |
| **1:15pm – 1:35pm** | **"Soil Survey in NYS Environmental Programs"**<br>**Ron Kaplewicz, Director, NYSSWCC, Albany, NY** |
| **1:35pm – 3:00pm** | **Status Reports of Committees**<br>**Carolyn Olson**<br>**Committee Chairs** |

**3:00pm – 3:30pm** **Break**

**3:30pm – 5:00pm** **Committee Meeting – Breakout Rooms**
**Research Needs**
**Soil Taxonomy**
**SSURGO/Map Finishing**
**Site Specific Soil Mapping**
**Hydric Soils**
**Subaqueous Soils**
**Technical Soil Services**

**6:00pm – 7:00pm** **Social – Crystal Room**

***Tuesday, June 25, 2002***

**8:00am – 10:00am** **Committee Meetings**

**10:00am – 10:20am** **Break**

**----------General Session – Technical Presentations---------**
**Tyrone Goddard, NRCS, State Soil Scientist, NY, Moderator**

**10:20am - 10:40am** **Update on NSSC Activities**
**Carolyn Olson, NCSS, NRCS, Lincoln, NE**

**10:40am - 11:00am** **Research on Subaqueous Soils**
**Marty Rabenhorst, University of MD**

**11:00am - 11:20am** **"Use of Soil Survey in Environmental Modeling"**
**Stephen DeGloria, Cornell University**

**11:20am - 11:40am** **"Assessing P Sorption Capacity in the NE"**
**Ray Bryant, USDA-ARS Pasture & Watershed Management Research Unit, University Park, PA**

**11:40am - 12:00pm** **"Classification and Interpretation of Urban Soils"**
**Joyce Scheyer, NSSC, NRCS, Lincoln, NE**

**12:00pm - 1:00pm** **Lunch**

**-----------General Session – Technical Presentations ----------**
**Mark Silverman, NRCS, NY Soil Scientist, Moderator**

**1:00pm - 1:45pm** **SSURGO/Map Finishing Updates**
**Mike Kortum, NCGC, NRCS, Ft. Worth, TX**
**Caryl Radatz, DMF Unit, NRCS, Columbia, MO**

**1:45pm - 2:10pm** **"Dynamic Soil Properties" and Soil Quality Institute Update**
**Ann Lewandowski, Soil Quality Institute, St. Paul, MN**

**2:10pm - 2:40pm** **"Landslides in Sensitive Marine Clays (LEDA Clays) of the St. Lawrence Lowlands"**
**Jan Aylesworth, Geological Survey of Canada, Ottawa, ONT.**

**2:40pm - 3:00pm** **Soil Survey Activities at SUNY-Environmental Science and Forestry**
**Russell Briggs, SUNY-ESF, Syracuse, NY**

**3:00pm – 3:30pm** **Break**

**----------General Session – Technical Presentations-----------**
**Stephen Page, NRCS, NY Soil Scientist, Moderator**

**3:30pm – 4:00pm** **Vermont Automated Compilation Procedures**
**Steve Gourley, NRCS, Colchester, VT**

**4:00pm - 4:20pm** **"Using Soil Surveys for Site Assessments in the Adirondack Park"**
**Brian Grisi, Adirondack Park Agency, Raybrook, NY**

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| **4:20pm - 5:00pm** | **The NY Digital Ortho-Photography Program**<br>**Tim Ruhren, Office For Technology, Albany, NY** |

***Wednesday, June 26, 2002***

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| **7:15am** | **Board buses at Bonnie Castle Resort**<br>**(*Lunch will be provided with the field trip)*** |
| **8:00am – 5:00pm** | **Northern NY Soils Field Tour**<br>**Steve Carlisle, Ed Stein, Steve Indrick** |
| **6:00pm** | **Barbecue Cookout – Poolside Cafe** |

***Thursday, June 27, 2002***

| | |
|---|---|
| **8:00 am – 9:00 am** | **Breakout Sessions (NEC-50; NRCS)** |

**------------General Session – Committee Reports-------------**
**Paul Puglia, NRCS, NY Soil Scientist, Moderator**

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|---|---|
| **9:00am – 9:30am** | **NRCS Breakout Report**<br>**NEC-50 Breakout Report** |
| **9:30am – 9:45am** | **Committee 1 Report – Research Needs** |
| **9:45am – 10:00am** | **Committee 2 Report – Soil Taxonomy** |
| **10:00am – 10:15am** | **Committee 3 Report – SSURGO/Map Finishing** |
| **10:15am – 10:30am** | **Break** |
| **10:30am – 10:45am** | **Committee 4 Report – Site Specific/High Intensity Soil Survey, NCSS Standards** |
| **10:45am - 11:00am** | **Committee 5 Report - Hydric Soils** |

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|---|---|
| **11:00am – 11:15am** | **Committee 6 Report – Subaqueous Soils** |
| **11:15am – 11:30 am** | **Committee 7 Report – Technical Soil Services** |
| **11:30am – 12:00am** | **Committee Reports Questions and Discussion** |
| **12:00pm – 1:00 pm** | **Lunch** |

**------------General Session – Technical Presentations----------**
**Cathy Keenan, NRCS, NY GIS Specialist, Moderator**

| | |
|---|---|
| **1:00pm - 1:20pm** | **The Soils Ontario Project**<br>**David Kroetsch, Agriculture & Agri-Food Canada, Ottawa, ONT.** |
| **1:20pm - 1:40pm** | **Marketing Soil Survey**<br>**Joyce Scheyer, NSSC, NRCS, Lincoln NE** |
| **1:40pm - 2:15pm** | **Soil & Resource Assessment Update**<br>**Maurice Mausbach**<br>**Deputy Chief, NRCS, Washington DC** |
| **2:15pm - 2:45pm** | **Soil Survey Division Activities**<br>**Maxine Levin, Soil Survey Division, NRCS, Washington, DC** |
| **2:45pm - 3:15pm** | **Break** |
| **3:15pm - 4:00pm** | **MLRA 12, 13, & 14 Reports**<br>**Bruce Thompson, NRCS, Amherst, MA**<br>**Steve Carpenter, NRCS, Morgantown, WV**<br>**John Kelly, NRCS, Raleigh, NC** |
| **4:00pm - 5:00pm** | **NECSSC Business Meeting**<br>**Stephen DeGloria, Tyrone Goddard**<br>**NECSSC Steering Team Co-Chairs** |
| **6:00pm** | **Dinner Cruise** |

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| | **Uncle Sam Boat Tours** |

***Friday, June 28, 2002***

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|---|---|
| **8:00am – 10:00am** | **Submit Reports for Compilation of Proceedings** |
| | **NRCS State and University Reports**<br>**MLRA Regional Reports (12, 13, 14)**<br>**Committee Reports**<br>**Technical Speakers**<br>**Breakout Sessions**<br>**Business Meeting** |
| **10:00am** | **Adjourn** |

## Conference Participants

**Barbara Alexander, NRCS-CT**
**Debbie Anderson, NRCS-NC**
**Gail Arrow, NRCS-NY**
**Jan Aylesworth, Geological Society of Canada**
**James Baker, VPI & SU**
**Russell Briggs, SUNY-ESF**
**James Brown, NRCS-MD**
**Leander Brown, NRCS-Wetland Science Institute, MD**
**Ray Bryant, ARS-PSWMRU, PA**
**Steve Carlisle, NRCS-NY**
**Kathy Carpenter, NRCS-NY**
**Stephen Carpenter, NRCS-WV**
**Edward Ciolkosz, Penn State University**
**William Dean Cowherd, NRCS-MD**
**Stephen DeGloria, Cornell University**
**Charles Delp, NRCS-WV**
**Robert Dobos, NRCS-WV**
**Bruce Dubee, NRCS-VA**
**Delvin Fanning, University of Maryland**
**Shawn Finn, NRCS-MA**
**Steven Fisher, NRCS-MA**
**Deborah Frigon, NRCS-CT**
**John Galbraith, VPI & SU**
**Tyrone Goddard, NRCS-NY**
**Stephen Gourley, NRCS-VT**
**Brian Grisi, Adirondack Park Agency**
**Karl Hipple, NRCS-NE**
**Wayne Hoar, NRCS-ME**
**Scott, Hoover, NRCS-WV**
**Steve Hundley, NRCS-NH**
**Wade Hurt, NRCS-FL**
**Steve Indrick, NRCS-NY**
**Anthony Jenkins, NRCS-WV**
**Cathy Keenan, NRCS-NY**
**John Kelley, NRCS-NC**
**Ron Kaplewicz, NYSSWCC**
**Philip King, NRCS-DE**
**David Kingsbury, NRCS-WV**
**Kipen Kolesinskas, NRCS-CT**
**Michael Kortum, NRCS-NCGC, TX**
**Lisa Krall, NRCS-CT**
**David Kroetsch, Agriculture & Agri-Food Canada**
**Katie Lane, NRCS-NY**

**Maxine Levin, NRCS-DC**
**Ann Lewandowski, NRCS-SQI, MN**
**Henry Lin, Penn State University**
**David Marceau, Marceau Environmental Consultants, ME**
**Maurice Mausbach, Deputy Chief, Soil Survey & Resource Assessment, DC**
**Andrew McDonald, NRCS-NY**
**Shawn McVey, NRCS-CT**
**Darlene Monds, NRCS-MA**
**Brian Needelman, University of Maryland**
**Carolyn Olson, NRCS-NE**
**Laurie Osher, University of Maine**
**Steve Page, NRCS-NY**
**Beth Polge, NRCS-NY**
**Tim Prescott, NRCS-WV**
**Paul Puglia, NRCS-NY**
**Martin Rabenhorst, University of Maryland**
**Caryl Radatz, NRCS-MO**
**Tim Ruhren, Office of Technology, NY**
**Joyce Scheyer, NRCS-NSSC, NE**
**John Sencindiver, West Virginia University**
**Mark Silverman, NRCS-NY**
**Gerald Smith, NRCS-NY**
**Edward Stein, NRCS-NY**
**Mark Stolt, University of Rhode Island**
**Everett Stuart, NRCS-RI**
**Ronnie Taylor, NRCS-NJ**
**William H. Taylor, NRCS-MA**
**Pam Thomas, NRCS-VA**
**Bruce Thompson, NRCS-MA**
**Theodore Trevail, NRCS-NY**
**Bruce Vasilas, University of Delaware**
**Lenore Vasilas, NRCS-DE**
**Peter Veneman, University of Massachusetts**
**Thomas Villars, NRCS-VT**
**Ed White, NRCS-PA**
**Kristie Wiley, NRCS-MA**
**Andrew Williams, NRCS-MA**
**YiYi Wong, NRCS-NY**

# NECSSC Business Meeting Minutes

## June 27, 2002

The meeting was called to order at 4:10 p.m.

Tyrone Goddard/Steve DeGloria, NECSSC Co-chairs, presiding

I. Committee Reports/Recommendations-Carolyn Olson

- All committee reports and recommendations were accepted.
- SSURGO/Map Finishing and Site Specific Mapping Standards Committees were dissolved.
- Hydric Soils, Subaqueous Soils, and Technical Soil Services will continue as ad hoc committees.
- A proposal was brought forth for a new standing committee for the purpose to maintain uniformity in standards relating to technical issues for all aspects of the soil survey program. After discussion it was agreed that the new standards committee would be an ad hoc committee for now.

II. Meeting site for 2004 NECSSC – Tyrone Goddard

- Discussion went back and forth as to who could host the conference in 2004. Pennsylvania or a collaboration of Delaware and New Jersey was suggested
- Steve Carpenter offered to host the next conference in Shepherdstown, WV, which was accepted.
- Karl Hipple made recommendation to change bylaws to set up rotating schedule for hosting the conference.

With no further business to discuss the meeting was adjourned at 4:25 p.m.

Respectfully submitted,

Gail Arrow

## NEC-50 Report

NECSSC University Cooperators' Report

Peter L.M. Veneman
Massachusetts Agricultural Experiment Station
University of Massachusetts
Amherst, MA 01003
veneman@pssci.umass.edu

*Attendants*: Bruce Vasilas (Delaware); Laurie Osher (Maine); Marty Rabenhorst, Del Fanning and Brian Needelman (Maryland); Peter Veneman (Massachusetts); Steve DeGloria (Cornell); Ed Ciolkosz and Henry Lin (Penn State); Mark Stolt (Rhode Island); John Sencindiver (West Virgia); Jim Baker and John Galbraith (Virginia).

The North East National Cooperative Soil Survey's University Cooperators met to discuss the resurrection of regional committee NEC 50. Peter Veneman was elected chair pro-tem. Upon termination of NEC 50 some years ago, most Cooperators kept on meeting annually, either at the NECSSC or during the annual regional field trips. The region presently has several young researchers who have research interests in the area of hydropedology, a topic of interest to established faculty as well. A regional umbrella project will be proposed allowing us to meet annually in a formal setting to exchange ideas and research progress. The following three projects were proposed: sub-aqueous soils, wetland problem soils, and carbon sequestration in wetland soils. These topics are connected by a common tread, i.e. water. Another project, to provide quantitative information for interpretive tables specifically water table data, possibly could be made part of the regional project as well. Some of the proposed projects can be, and in some states, already have been funded by state and federal agencies. Dr. Steve Goodwin, Massachusetts Experiment Station Associate Director, has indicated his willingness to serve as the advisor to the regional umbrella project. The plan is to prepare the regional proposal over the summer to submit a formal copy to the Directors at their September meeting.

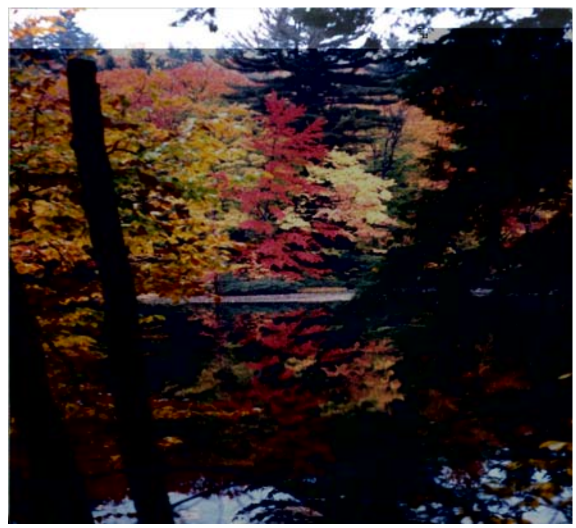
Pennsylvania State University will host the soil judging competition this fall. Del Fanning, Professor Emeritus at the University of Maryland and a native of up-state New York, indicated his willingness to organize the regional pedology field trip next year in north-central New York state. This offer was dependent on the willingness of local NRCS field personnel to provide help with the field sites. Marty Rabenhorst was elected to serve as the regional representative to next year's National Cooperative Soil Survey Conference to be held in Plymouth, Massachusetts. Peter Veneman will serve as an alternate.

# Field Trip

**Guidebook**

## Introduction to the St. Lawrence Lowlands and Adirondack Mountains Physiographic Provinces

**2002 Northeastern Cooperative Soil Survey Conference, Alexandria Bay, New York**



# 2002 Northeast Cooperative Soil Survey Conference, Alexandria Bay New York Field Trip--Introduction to the St. Lawrence Lowlands and Adirondack Mountains Physiographic Provinces

**June 26, 2002**

**Steven C. Carlisle[1]**


The map above is a portion of "Carte de la nouvelle France" *in* Champlain, Samuel de, 1632. Les Voyages de la Nouvelle France Occidentale, dicte Canada. Paris, FR. For those traveling in personal conveyances the route of travel for this field tour begins south of the St. Lawrence River, directly under the hind feet of the deer. Thence NE to the peninsula slightly east of the confluence of the forked river and the St. Lawrence River (east of the word "sault"). Thence to the place between the forks of the aforesaid river for lunch. Thence to a place clearly marked by the northwest corner of a rectangular pattern of E-W trending parallel lines. Thence to a place obviated by the intersection of an N-S line emanating from the t in the word "sault" that is southeast of the deer, and a line that is a projection of the south-most tangent section from the eastern fork of the forked river. Thence to the point of origin, and dinner.

**Introduction**. Aside from incredible physical beauty, the North Country of New York State has many interesting attributes to recommend it to those in the Natural Sciences. This field trip is intended to be an introduction to the geology, landscapes, soils and

[1] Soil Scientist, USDA-NRCS, Seneca Falls, New York

people that comprise The St. Lawrence Lowlands and Adirondack Mountains of New York State.

**History and Culture**. The St. Lawrence Lowlands and the Adirondack Mountains dominate the northern lobe of New York State. This region is rich in natural beauty, rich in natural resources, and frigid in climate. Originally, it was the scene of border strife between the Iroquian speaking Huron (Wyandot) confederacy, their allies the Ojibwe speaking Ottawas and the Five nation Iroquoian confederacy, the Haudenosaunee. With the obliteration and dispersal of the Wyandots during the Beaver Wars by 1649, the area came under the undisputed hegemony of the Haudenosaunee. The Haudenosaunee, in turn, gave way to American settlement at the close of the Revolutionary war. The region was an area of bloody strife during the War of 1812. As the 19$^{th}$ century progressed the more level landscapes were cleared for agriculture. The lumbering and the milling of forest products were important industries throughout the region into the early 1900's. The prohibition era provided a lively vocation for many residents of the region, running bootleg booze from across the Canadian border. One of the more notorious court cases of that era occurred in nearby Malone: the trial of Dutch Schultz on tax evasion—he was acquitted of course. The following poem is probably a good representation of North Country attitudes regarding prohibition (DeSormo, 1974):

*Sisters in the pantry bottling the suds*
*Fathers in the cellar mixing up the hops*
*Johnnys on the front porch watching for the cops*

Today, there remains ample evidence in the folk and folkways of the Adirondack and St. Lawrence Regions that suggests its rich heritage. There is a high proportion of French surnames in telephone directories that speak to the region's pre-colonial and post-colonial history (there was an influx of French immigrants following the French Revolution), as well as the nearness to Quebec, the nomadic travels of early loggers, and the fact that they often settled where they found work. Knit hats are called toques in the North Country and those that call them so have little choice but to be rabid hockey fans. In the fall, when the leaves turn color and the air is crisp, adult males separate from the females and children, and gather in rustic camps throughout the North Country woods and partake in primordial rites inherited from their hunter-gatherer ancestors. What they do there is any one's guess, but when they again rejoin their families, it is clear from the wrinkled noses and grimaces all around that bathing was probably not a large part of the itinerary.

Dairy farming remains the staple industry of the St. Lawrence Lowlands. Subsurface and open pit, talc, tremolite, and zinc mining continues to be viable in the Frontenac Axis around Gouverneur. Aluminum smelting which began in 1900, is still a large employer around Massena. St. Lawrence University and Canton Technical College bolster the culture and economy of the Canton area, while Potsdam State College and Clarkson University perform a similar function for the Potsdam area.

The economy of the Adirondack Mountains is dependent on forest industry and tourism. It is interesting to note that much of the Adirondack Mountains are within the Adirondack Park. This park of 6 million acres is as large as the Grand Canyon and Yellowstone National Parks combined. It compares to the size of Vermont.

**Geology and Physiography**. The fine sediments that lie on the nearly level topography are the most compelling geological feature for much of the St. Lawrence Lowlands. These fine sediments represent materials, deposited in lacustrine, brackish water and marine environments that held sway as the Laurentide ice sheet was retreating, and before the ice depressed landscapes rebounded. Kern and Bryant in *Soils Developed in Sediments from Late Quarternary Water Bodies in Late Quaternary Water Bodies in Northern New York* provide an excellent synopsis of the work of various geologists in piecing together the history of the various stages of the Champlain Sea and Lake Iroquois. Additionally, they have augmented earlier work by tying marine and lacustrine environments to soil characteristics, thereby decreasing the reliance on fossil evidence to map these entities. A reprint of this publication is in appendix 8.

The St. Lawrence Lowlands bracket the St. Lawrence River. As can be seen in the shaded relief map on page 5, the St. Lawrence Lowlands lie north of the Adirondack Mountains and blend with the Champlain Lowlands and the Lake Ontario Plain, east and west. The St. Lawrence Lowlands are largely a nearly level to gently sloping landscape of low glacial till hills, and intervening basins and planar areas where clayey sediments occur.

The southern end of the St. Lawrence Lowlands is transected northwest to southwest by the Frontenac Axis, which in simple terms is an umbilical cord of Precambrian crystalline rocks connecting the Canadian Shield with the Adirondack Mountains. These crystalline rocks dominate landscapes in St. Lawrence County, generally south of a line between the east end of Black Lake and the Village of Canton. Not far south of Canton they merge with the Adirondack Physiographic Province. The relief features in the Frontenac Axis are often bereft of glacial till sediments, exhibiting much exposed bedrock. These knolls, dominated by exposed bedrock, are called glaciated rock knobs or roches moutonnee. The intervening basin areas, again are dominated by fine sediments. Where the St. Lawrence River crosses the Frontenac Axis the roches moutonee are manifested as the Thousand Islands.

Locally, within the St. Lawrence Lowlands there are sandy or gravelly deposits, which represent deltas at various lake or marine levels. (see appendix 8: J.S. Kern and R. B. Bryant) Marine sediments are concentrated at lower elevations, east of Morristown.

East of the Frontenac Axis and north of Black Lake, to the vicinity of Ogdensburg, Cambro-Ordovician Potsdam Sandstone and the overlying dolomitic Cambro-Ordovician Theresa Formation control the landscapes. In the St. Lawrence Lowlands east of Ogdensburg and the NW-SE trending Frontenac Axis the glacial drift and lacustrine and marine sediments that overlie the bedrock are generally deep. The bedrock underlying these deeper sediments is the Theresa Dolomite close to the river and Potsdam Sandstone further south. Incidentally, Potsdam Sandstone was quarried in the vicinity of the village of Potsdam by the Clarkson Family who founded Clarkson University. Potsdam Sandstone is an excellent building stone and was used in the Canadian Parliament buildings in Ottawa.

Unlike linear mountains systems like the Appalachians, the Adirondack Mountains are an uplifted dome like the Llano Uplift in Texas (USGS, undated). Paleozoic rocks, well represented in surroundi
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**Soil Climate**. While it is clear that the St. Lawrence River and the air drainage along its course have an ameliorative affect on climate, the soils in the St. Lawrence Lowlands are frigid based on temperature studies by soil survey parties in both Jefferson and St. Lawrence County in the late 1970's. While the studies supported different conclusions, the mesic-frigid break had to occur somewhere, and the Frontenac Axis provided a handy physiographic feature along which to draw the line. Conventional wisdom supported a frigid soil climate regime for this region because the climate had long been associated with the inability of the region to produce grain corn, at least on the American side. With the introduction of short season varieties, grain corn is grown here and there throughout the St. Lawrence Lowlands. Canada has a different perspective of soil climate in the St. Lawrence Lowlands. Other than the soil resource in the Niagara Peninsula and on the West Coast, soils in the St. Lawrence Lowlands are some of the most climatically favorable that they have.

The soils throughout the Adirondack Mountains are frigid at lower to mid-elevations. At elevations above 3000 feet the soil climate is cryic.

**Soil Survey St. Lawrence County**. Most of the St. Lawrence Lowlands and Adirondack Mountains that this field trip will pass through are in St. Lawrence County. At nearly 2 million acres, St. Lawrence County is larger than the states of Rhode Island and Delaware combined. The soil survey of St. Lawrence County began in 1973 and ended in 1989 (and is still unpublished). Incidentally, Jim Brown, now the State Soil Scientist in Maryland, was the Party Leader from 1976 until 1980.

The Northern Part of the Soil Survey area was mapped at a "detailed" level of intensity to accommodate the mostly rural and agricultural nature of the St. Lawrence Lowlands. The scale originally was 1: 15840 but was later changed to 1:24000. For the most part, the landforms were fairly evident so that mapping was reasonably straightforward and conducted conventionally by Soil Scientists working alone. In the Hammond and Morristown area, north of Black Lake over the flat-bedded Theresa and Potsdam formations, however, mapping was difficult and tedious. Depth to bedrock was not always evident from subtle differences in topography or plant life, nor was it conspicuously exposed at the surface.

The Adirondack Mountains in Southern St. Lawrence County are manifested as low mountains or hills set in a myriad of lakes, streams, and bogs. Access is made additionally difficult by a sparse road net. The region is intensely forested. To accommodate these characteristics and the socio-economy, a less intensive legend was developed. This legend consisted largely of complexes and associations at a scale of 1:62500. Mapping for this area was mostly conducted by details. Often, two person teams were used for safety reasons.

**Trip Log**

000 Leave Alexandria Bay and the Bonney Castle. Incidentally the Indians called the Thousand Islands "Monotoana" or Garden of the Great Spirit.

.8 Junction of Rt. 12—**Turn** Left on to Rt. 12.

2.1 Road cut Potsdam Sandstone.

2.4 Cranberry Creek.

3.6 Potsdam Sandstone roadcut.

3.8 Rest Area.

4.3 Goose Bay. Site of Battle of Cranberry Creek, War of 1812. On July 20, 1813, 72 Americans under the command of Major Dimoch, including a contingent of Mohawk Valley Sharpshooters defeated 600 British seaman and soldiers under the command of Captain Samuel Dickson. The British were attempting to escort a bateaux carrying munitions, 170 barrels of salt pork, 270 bags of pilot bread and other supplies up-river to Kingston. The Americans captured the bateaux with their small force, and attempted to escape with it. The British, using the 18 gun brig Elmira, attempted to recover the bateaux but could not follow the Americans into the shallow water depths of Goose Bay. In the land and shallow draft boat engagement that followed, the fortified Americans killed or captured all but 80 men of the British force numbering in the vicinity of 600. It was one of the bloodier engagements of the northern frontiers (Service, 1976).

4.7 Roches Moutainee, Grenville age granite gneiss. The Thousand Islands and the Frontenac Axis consist of swarms of these glaciated rock knobs and intervening clay lined basins. Grenville Marble is interwoven with the granite and gneiss. Summerville[2], a Lithic Eutrudept, was mapped over the marble bedrock and Insula[3], a Lithic Dystrudept, was mapped over the granite and gneiss. The clay-lined basins were mapped within a catenary sequence of Huevelton[4], Muskellunge, or Adjidaumo[5]. All of these soils are fine, mixed, frigid. Huevelton and Muskellunge are Alfisols, while Adjidaumo is an Inceptisol. Incidentally, the origin of the name for the Adjidaumo Series has been a source of speculation and wry comments from a number of sectors. Hearkening back to an earlier class in English Literature, perhaps the reader will recall that “Adjidaumo” was the red squirrel that sat on the bow of Hiawatha’s canoe in Longfellows canoe, it is also the name of an obscure lake in the Frontenac Axis.

7.8 Crooked Creek (Duck Cove). Historically, the Thousand Islands was one of the great waterfowl hunting areas in the country.

8.6 to 9.7 Potsdam Sandstone roadcuts.

10.8 Cedar Island sign.

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[2] OSD in Appendix 4
[3] OSD in Appendix 4
[4] Pedon description in Appendix 4
[5] Pedon description in Appendix 3

12.5 Chippewa Creek.

13.2 Granite rock cuts.

13.4 Large rock cut, Theresa Formation. The flat lying sedimentary Potsdam Sandstone and Theresa Dolomite control many of the landscapes from here to Ogdensburg. Matoon, a moderately deep analogue of Muskellunge, and Guff, a shallow analogue of Adjidaumo were initiated to accommodate landforms where the lacustrine and brackish water parent materials are shallow and moderately deep to bedrock. In places, imperfectly drained glacial till soils that are shallow and moderately deep to bedrock occur. To accommodate these soils, the moderately deep to bedrock, somewhat poorly drained Ogdensburg[6] series and the e shallow to bedrock, poorly drained Hannawa[7] series were initiated. Interestingly enough, the Ogdensburg, Hannawa, and Runeberg series in the St. Lawrence County legend are Mollisols.

14.3 Parking area at east end of rock cut.

14.9 More Theresa Formation, nearby farm with blue silo.

17.1 Large rock cuts.

17.7 Parking area.

19.7 Wooded, nearly level landscape. Ogdensburg and Hannawa soils. Northern white cedar, Canadian yew and hophornbeam are common trees over these soils.

23.5 Morristown. One of two villages in St. Lawrence County named after Gouverneur Morris, an important political figure before, during and after the revolutionary war.

30.5 Mater Dei College.

31.0 Deep Till Hill. Grenville, (Typic Eutrudepts) Hogansburg (Aquic Eutrudepts), Malone[8] and Runeberg constitute the catena that developed in very deep glacial till. Interestingly, when Marlin Cline set up the Grenville and Hogansburg series, he separated them from Nellis and Amenia on the basis of Ca-Mg ratios. The higher ratios in Grenville and Hogansburg soils are caused by the influence of Theresa Dolomite on the parent materials.

32.0 Wadhams Hall Seminary.

33.1 Bed rock exposure.

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[6] Pedon description in Appendix 4
[7] Pedon description in Appendix 4
[8] Pedon descriptions for Grenville, Hogansburg and Malone are in Appendix 4

33.4 Ogdensburg. Ogdensburg, with a population of around 14,000, is the largest community in St. Lawrence County. Euro-American Ogdensburg began with the establishment of Fort LaPresentation in 1749 at the confluence of the St. Lawrence and Soegatsi (now called the Oswegatchie) River. The site for the fort was an old Indian village site called Swa-gatch, at the northern terminus of a trail connecting the St. Lawrence with the Mohawk Rivers. After a difficult beginning, the founder of Fort LaPresentation, the Sulspician Missionary Father Picquet, gathered a sizeable flock of converts. He even managed to cause a fracture in the Iroquois League by suborning Mohawk converts to take up arms for the French, the mortal enemies of the Haudenosaunee.

In the early 1800’s, before the War of 1812, David Parish settled in Ogdensburg with his assets of 28 million dollars earned through creative trading in the capitals of Europe. His store, opened in 1810, is the oldest continuously used Federal office building in the country. David Parish lived in Ogdensburg only a short time and then returned to Europe where he committed suicide. His Ogdensburg home, also built in 1810, became the home of his nephew George Parish and his paramour, Ameriga Verspucci, a descendant of Amerigo Verspucci, for whom America is named after. Ameriga was a fortune hunter who sought wealthy companionship wherever it could be found--even in the humble village of Evans Mills, not far from Watertown, where George won. her in a card game from “Prince” John Van Buren, the son of Martin Van Buren (the President). The stone inn in Evans Mills where the hand and the rest of Ameriga Verspucci was fairly won is still standing. Whatever the case, Ameriga Verspucci and George Paris lived together for the next 17 years, when presumably one or both of them died, or George simply ran out of money. David Parish’s house later housed Fredrick Remington’s widow and family, and now houses the Fredrick Remington Museum, along with a considerable collection of his works.

It should be noted that Ogdensburg is the site of the War of 1812 Battle of Ogdensburg, occurring on 22 Feb 1813. The British, under Lt. Col. George MacDonell were victorious in this action when they crossed the St. Lawrence ice and drove off Captain Forsyth and the 1st US Rifles. Considerable damage was inflicted on buildings within the village. After the battle, the British withdrew.

35.2 Bridge over Oswegatchie River.

43.8 Red Mills. Dredge deposits from the excavation of the St. Lawrence Seaway are visible as hills near the shore of the river and islands within it. The telltale 10YR 5/2 color on the eroded banks of islands identifies them as fill. The St. Lawrence County Soil Survey legend classified these dredged soils to the great group level as udorthents. Mapping units were differentiated within great groups by surface texture: sandy, clayey or loamy. All of these soils are effervescent at the surface.

The first European to ply the St. Lawrence River was Jacques Cartier in 1535. The Indians called it "The River That Walks", however it was Samuel de Champlain who named it the St. Lawrence River, nearly a hundred years after Cartier first visited it.

Until the St. Lawrence Seaway was opened in 1959, much of the St. Lawrence River was not navigable. Early travelers such as Indians, voyagers, missionaries, and soldiers, spent much their time portaging around rapids. The Seaway opened mid-continent, Great Lakes Ports to deep draft ocean shipping. As one might expect, the project was the result of a great deal of Canadian and Mid-western United States political pressure. Naturally enough, opposition came from railroads, the coal mining industry and eastern and Gulf of Mexico ports. One might reflect that when Buffalo lost the Super Bowl to the Giants it was nothing compared to their loss when the St. Lawrence Seaway opened (Buffalo has since lost half of its population). The St. Lawrence Seaway also produces significant hydro-electrical power.

45.3 Big fill hill.

46.8 Eroding fill bank alongside river.

48.1 Iroquois Dam is visible north of Rt. 37.

52.9 Malone and Runeberg soils on the flat lying landscape on the outskirts of Waddington.

54.3 Grenville and Hogansburg soils on drumloidal features.

54.5 Sucker Brook.

56.1 Brandy Brook. Large sand plain related to the delta of the Grasse River, Coles Creek, etc. A catena of Adams, Croghan[9], Naumburg, and Searsport soils was used to map these landscapes. In some places, Deford[10] (an Inceptisol) was mapped instead of the spodic Naumburg. Crescent shaped ridges of Adams soils, presumably shaped by wind, are widely distributed in this large sand plain.

58.6 Coles Creek Marina.

60 Glacial Till. Till, and the Grenville catena can be separated from the sandy deltaic soils at a glance. Northern white cedar is uncommon on the sandy soils, while aspen and gray birch are very common on such soils. Stone fence lines, and stony surfaces are also good indicators.

63.4 Raymondville-Lousiville Rd. Chunks of ortstein sloughing out of Naumburg soils create a gravelly beach, north of here in the Wilson Hill Wildlife Management area, along the shore of Lake St. Lawrence.

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[9] Pedon description in Appendix 4
[10] Pedon descripton in Appendix 4

68.5 Grasse River. One of three major rivers springing from the Adirondacks that empty into the St. Lawrence around Massena. The mouths of the Raquette and the St. Regis are farther east.

68.9 Junction with Rt. 56.

69.8 Village of Massena. The village was named after General Andre' Massena, who served under Napoleon Bonaparte. The construction of the Massena Power Canal, connecting the Grasse and St. Lawrence Rivers, enabled the establishment of the aluminum smelting industry here in 1902 (the Pittsburgh Reduction Company). The source of water energy for hydroelectric generation was key, as aluminum smelting requires an enormous amount of electrical power. The Pittsburgh Reduction Company later became known as the Aluminum Company of America. Spoil excavated from the power canal between 1900 and 1902 remains effervescent to this day.

73.8 **Turn Left at Mall on to Rt. 131** towards Robert Moses State Park.

75.6 **Bear right as 131 goes left**.

76.1 Eisenhower Locks—it can be eerie driving under an ocean freighter.

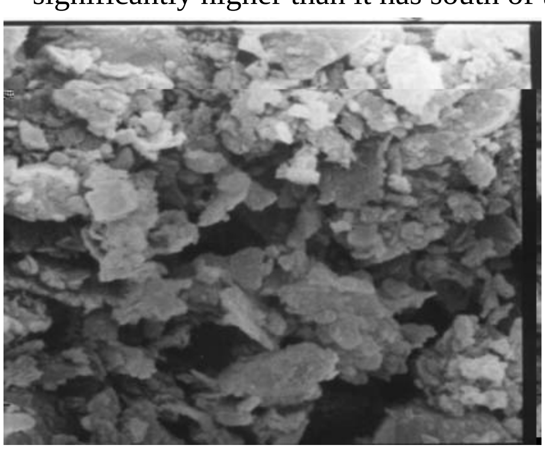
Grenville and Hogansburg soils are on hill crests and sideslopes. Some of the crests evidence winnowing of fines by wave action. Malone on lower backslopes. Muskellunge on footslopes and Adjidaumo in basins, on toe slopes. Where the marine sediments are covered by slope wash or fines winnowed from the till relief features, the poorly drained Swanton soils occur.

77.1 **Turn Right on to Robinson Bay Rd**. There is an information booth on the right.

78.8 **Turn left on to small paved road** (the second road opening to the left)

79.0 **Turn Right at T** and continue down this old farm to market road.

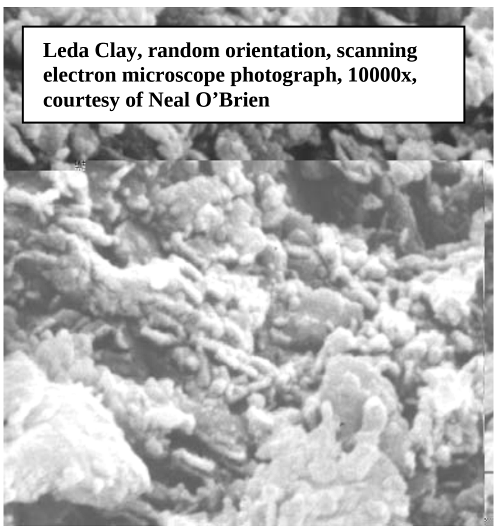
79.6 **Stop 1 at bend in the road**. Adams soils over marine clays. The object of this stop is to observe the clayey substratum of these soils, the Leda Clay, a thixotropic "quick" clay. This site was also a stop in the 1984 Friends of the Pleistocene Field Trip. The fossiliferous Leda Clay is a geologically significant deposit throughout the St. Lawrence Lowlands, but especially in Canada, where isostatic rebound has raised landscapes significantly higher than it has south of the border (thicker ice). This higher relief has resulted in a much greater incidence of landslides and other failures tied to these sensitive materials. Laboratory data may be found in Appendix 5.



ation, scanning
graph, courtesy

The Leda Clay derives its name from the French equivalent for the Macoma sp. clam shells that are common in these deposits. These clays were deposited in a maritime environment associated with the Champlain Sea. They are thixotropic, that is, they undergo a sol-gel-sol transformation when going from an undisturbed state to a disturbed state, and then back to an undisturbed state. Particle size, mineralogy, and state of flocculation are characteristics that seem to affect thixotropy.

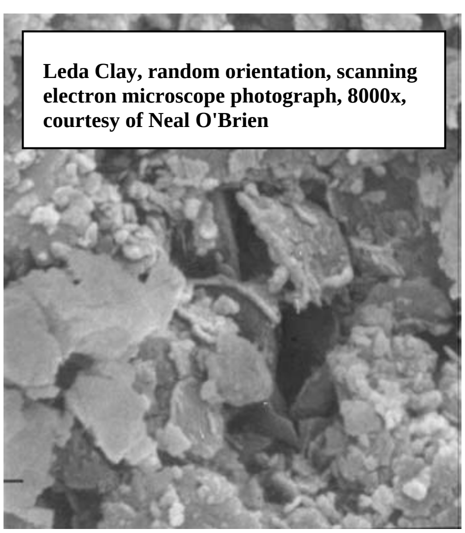
**How the thixotropy works**. First consider that the clay is actually an assemblage of two kinds of water, clay particles, other mineral particles, and cations. One kind of water is "rigid" water, that is, water where the molecules are oriented by an attractant force on the clay flake. The other water is liquid water that acts in the capacity of a lubricant in the clay-water system. The positively charged part of the water dipole in the rigid water (thus acting like a cation) is attracted to the negatively charged surface on the clay micelle. Layers of rigid water molecules coat the micelles until the negative charge is largely neutralized and there is no longer a charge that is orienting the water. The excess water (the non-oriented liquid water) in the clay-water system fills the voids and serves as a lubricant when the clay is disturbed.



**Leda Clay, random orientation, scanning electron microscope photograph, 10000x, courtesy of Neal O'Brien**

"Thixotropic or sensitive clays tend to have a random orientation of clay flakes. This orientation is due to flocculation (attraction) of individual flakes into an edge-face or edge-edge cardhouse arrangement. Also common is a flocculated fabric composed of domains (or clumps of individual platelets arranged in an overlapping "stair-step" manner) The individual domains, in turn, are random oriented also in an edge-face or edge-edge cardhouse fabric. Void spaces are filled with liquid water which acts as a lubricant to cause the domains or individual flakes to slide into another orientation when equilibrium of the system is disturbed (e.g. when the clay is vibrated). Thus a landslide may result when a bank of sensitive clay is disturbed". (personal communication, Dr. Neal O'Brien, Potsdam State College).

In the clay structure, the clay micelles are in various stages of coherence or flocculation. Salts and polymers (Coates, 1975) within the still water environment caused the colloids to aggregate. These floccules are surrounded and separated by oriented water that is buttressed by the cations. Sodium, a common cation in the brackish and marine environments that the Leda Clays flocculated in, is a small monovalent cation that supports substantial layers of oriented water. Rosenquist (Grim, 1962) described a scenario analogous to the Leda Clays based on his observations of "quick" clays in Norway.



**Leda Clay, random orientation, scanning electron microscope photograph, 8000x, courtesy of Neal O'Brien**

According to Rosenquist, high sensitivity develops when the sodium is leached from the system without a change in water content. This water content is largely in an oriented state because of the sodium ion. When the sodium ion is removed, much of the orienting force is removed as well. Consequently, some of the oriented, adsorbed water is changed to pore water. In other words, leaching of the sodium ion weakens the interparticle water bonds. It reduces the liquid limit but not the water content. When the system is disturbed these weakened bonds are broken. Void spaces disappear, and the soil goes from a solid to a liquid.

There is laboratory data for the Leda Clay at this site in Appendix 4.

Also, an excavation is planned, as well as a GPR demonstration.

Coffee

80.2 **Turnaround** at Hawkins Point Lookout. The Robert Moses Power Dam can be viewed from this vantagepoint, and then back towards Massena on the road that parallels the ship channel.

Snell Locks can be seen from this road, the first in the set of locks that lifts vessels to the plane of Lake St. Lawrence.

83.4 **Left** on road to Eisenhower Lock.

84.1 Eisenhower Lock.

86.5 **Right** (SW) on Rt. 37.

90.0 **Left** on 420

90.3 Massena Springs-- a sulfur spring is in the park next to the Raquette River. In the 1800's, Massena was a popular focal point for those seeking the healthful benefits of mineral springs.

91.1 A series of till hills and marine basins. The hills are dominated by the well drained, coarse loamy Grenville soils on the crests, the moderately well drained, coarse loamy Hogansburg soils on the upper side slopes, and the somewhat poorly drained coarse loamy Malone soils on the upper foot slopes. The basins are dominated by poorly drained and very poorly drained, fine Adjidaumo soils. In places, the coarse loamy over clayey, poorly drained Swanton soils occur on the lower footslopes. Also, the euic, Hemic Haplosaprists, Carbondale muck or the Terric Haplosaprists, Dorval[11] muck occurs on some toe slope areas. The dominant

93.9 Landscape of sandy deltaic sediments redistributed in places by wind. Again, Adams, Croghan, and Naumberg soils are mapped in their respective topographic positions. Glacial till occasionally protrudes through these sandy blankets. Glacial till derived Hogansburg and Malone soils are marked by stone cover and change of vegetation.

94.2 Brasher State Forest. Klaus Flach did his graduate research here.

96.9 Glacial till.

98.0 Sand.

98.8 Large Swamp with stony till hill on N. side. There are over 100,000 acres of Histosols in St. Lawrence County. The euic, deep Carbondale muck and the euic, shallow Dorval muck were correlated in the St. Lawrence Lowlands, while dysic analogues, Greenwood (a Hemist) and Loxley were correlated in the Adirondacks.

99.5 Village of Winthrop.

110.2 Junction Of Route 11C. **Follow Route 420 bearing left**.

110.6 Bridge over St. Regis River.

111.7 **Turn right** on Route 11. Glacial till soils dominate this landscape. Pyrites[12] and Kalurah, Dystric and Aquic Dystric Eutrochrepts respectively, are beginning to replace the Typic and Aquic Eutrochrepts respectively, Grenville and Hogansburg soils on upland positions. The levels of carbonates in the till fabric at this point “down ice” has begun to diminish. “Up ice”, next to the St. Lawrence River, the glacial till is derived largely from the dolomitic limestone that the glacier overrode. This rock type brackets the river. Farther south the underlying rock is more acid sandstone. As the glacier ripped this more acid rock up, adding it to the drift it was carrying, at the same time it was diluting the level of carbonates in the drift. These more acid soils are the result. Malone soils still occur on lower backslopes and footslopes.

112.4 Bridge over St. Regis River---till on hills and clay in basins.

114.6 **Turn left** on to Route 47.

115.2 Sand and gravel deposits occur through this locale representing beach and deltas in pro-glacial lakes.

115.5 Buckton State Forest.

115.9 Till.

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[12] Description in Appendix 4

118.2  Passing Pear Bridge Rd.  Gradually making transition into the Adirondacks, the spodic Potsdam[13] and Crary soils are beginning to replace the Pyrities and Kalurah soils, where the substratum is firm and dense.  Where the substratum is friable, the spodic Berkshire[14] soil and Sunapee soils are replacing Pyrities and Kalurah.  The non-acid Malone soils are still occurring on lower backslope or footslope topography.

119.7  Passing Old Market Rd.

120.7 **Right turn on 11B at T intersection**, and then an **immediate left on road towards Parishville**.  Small outlier of Parishville Delta dominates landscape past stream, just north of the intersection.

121.6  Till—Malone.

123.5  Precambrian metamorphic rock outcrop.  The moderately deep Tunbridge[15] and the shallow Lyman soils have been correlated to bedrock controlled landforms in the Adirondack Lowlands.

123.8  Delta of the St. Regis River.  There are photographs in Appendix 6 of this landform.  This was also a stop on the 1984 Friends of the Pleistocene trip.

124.3  Village of Parishville.

124.9  Stop sign.  **Turn Right on Main Street Route 72.**

125.1  Bridge over St. Regis River.

125.4  Vista of delta is visible to the right from causeway.

**126.5  Turn left towards Colton on Route 58.**

127.5  Road cut on kame or ice margin deposit, at intersection of Chapel Hill Rd. There are pictures of this road cut in Appendix 7.   This is a Duxbury[16] like profile.  The loam to very fine sandy loam subsoil in these soils has been attributed to eolian deposition in a para-glacial environment. Potsdam and Crary are also predicated on an eolian cap. Intriguingly, at the south end of the road cut the loamy subsoil overlaid a substratum of varved silts, the sand and gravel layer had disappeared.

128.1  Large gravel pit.

130.4  Glacial Till.

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[13] Description in Appendix 4
[14] Description in Appendix 4
[15] Description in Appendix 4
[16] Description in Appendix 4

133.1  Glacio-fluvial.

134.3 **Turn left on Route 56—**Esker.

136.7  An erratic marks a spot where the glacier got its rocks off. Erotic?—to some perhaps.

137.0  South Colton.

138.3 **Turn right on to Cold Brook Drive**.

**140.5  Turn Right into Higley Flow State Park, and then stop at tollbooth, before proceeding onward.**

141.4  **Bear Right at T in road**.

141.8  Picnic area—lake to front, esker or crevasse filling on opposite side of parking lot. After picnic **retrace route to Route 56**.

143.5  **Turn left on Cold Brook Road**.

145.6  **Turn Right on Route 56**.

146.7  St. Lawrence University Ski Center lies west of Route 56, south of where the road makes a series of sharp turns as it wends its way through an esker.

148.5  Sign for the Adirondack Park.

150.0  The Plains.  A large sand plain, probably a pro-glacial lake delta of the nearby Raquette River.

153.7 Adirondack Landscape- Tunbridge-Lyman

154.1  Catamount Lodge, a conference center belonging to St. Lawrence University.

155.3  Graphic Granite—Erratic

156.9  Large bog west of the road. Greenwood and Loxley mucky peats are mapped in these basins, with the shallow Loxley at the edge of the bog and Greenwood normally in the interior.

159.6  Kame

161.1  Hams Inn

**164.0**  Sevey's Corners—**turn left on Rt. 3.**

166.9 Hamlet of Childwold. Potsdam, Crary, Tunbridge and Lyman soils were mapped on this planar landscape. At this point, "down ice", the glacial drift is derived almost exclusively from, acid crystalline rocks. In the lower parts of the till landscape, the non-acid Malone and Runeberg soils that dominated these landforms further north have been replaced by Lyme, Adirondack[17] and very poorly drained Tughill soils.

Stop 2. **Turn right into Massawepie Boy Scout Camp**. Continue for 2.3 miles along esker to the turnaround. The Colton soils that make up the esker may be viewed here. This esker is part of a system that approximately 100 miles long. Photographs of the profile may be found in Appendix 7. Laboratory Data for the profile may be found in Appendix 5.

Massawepie Esker

Colton
10/24/01
UTM: Zone 18, 0527865 easting, 4899424 northing
Elevation: 515 M
Adirondack Physiographic Region, esker
Aspect: west
Slope: 55%

A—0 to 2 inches, black (7.5YR 2/0) sandy loam, weak fine granular structure; very friable; many fine and medium roots; 10 percent gravel, 2 percent stones; very strongly acid; clear wavy boundary.

E—2 to 4 inches; pinkish gray (7.5YR 6/2); sandy loam; weak fine and medium subangular blocky structure; very friable; few fine and medium roots; 10 percent gravel, 2 percent stones; extremely acid; clear irregular boundary.

Bs—4-11 inches; strong brown (7.5YR 4/6) loamy sand; weak fine and medium subangular blocky structure; friable; common fine and medium roots; 30 percent gravel, 10 percent stones; very strongly acid; clear irregular boundary.

C—11 to 80 inches; pale brown (10YR 6/3)* loamy coarse sand/coarse sand; single grain; loose; common fine roots in the upper part; 40 percent gravel, 20 percent stones; strongly acid.

*note: color extremely variegated—pink feldspars, various light colored quartz, dark colored amphiboles, plagioclases, etc.

**After viewing retrace route to Route 3, then turn left (west) on Route 3**.

[17] OSD in Appendix 4

184.5 Bridge over the Grasse River

187.8 Cranberry Lake

196.1 **Turn left on Rd. to Wanakena**.

197.0 **Bear left towards the New York State Ranger School**

BC—20 to 24 inches light yellowish brown (10YR 6/4) loamy sand; weak medium subangular blocky structure; very friable; few fine roots; few coarse tubular pores; 10 percent gravel; strongly acid; clear irregular boundary.

2C—24 to 34 inches light yellowish brown (10YR 6/4) very gravelly loamy sand; inherited weak fine platy structure; very friable; few fine roots; 35 percent gravel; very strongly acid; clear irregular boundary.

3C—34 to 80 inches light gray (10YR 7/2 and very pale brown (10YR 7/3) sand, common thin black (7.5YR 2/0) black bands of magnetic sand; single grain; loose; 5 percent gravel; strongly acid.

Refreshments.

The New York State Ranger School began in 1912, and is the oldest Technical Forestry school in the United States. Uniquely, the initial classes of students literally built the first classrooms and dormitories.

Soil survey operations in the Adirondacks have usually involved spring and fall mapping details. These beginning and end of season operations have never been without difficulty or hazard. On one such spring venture all five trucks of a detail were stuck in the middle of various roads at the same time. On a fall detail two mappers got lost on a trail-less peak. Finally, clambering out of the bush early the next morning; with great bravado they claimed to have known exactly where they were the entire time. Falling through ice on beaver dams, rotting bridges collapsing under the weight of vehicles, etc. were normal occurrences. One of the more noteworthy “mapping vignettes” was captured in the following poem published in Soil Survey Horizons (Carlisle, 1994).

An Accident Report

Bill Kick and I were homeward bound in his 18 foot canoe
We had spent the day at Barber Point mapping soils with the crew

Wheeler and Hutton had gone on ahead with an outboard motor boat
So Kick and I paddled away, each kneeling on a float

The wind then diminished and the water was not so furious
So we took to our seats, which now seems most curious

You see, raising our center of gravity
Was a singular kind of depravity

I shifted my weight and over we went, splash into Witchhobble Bay
“To shore” Kick yelled, and swam for it 200 yards away

I told Kick that I'd stay with the canoe because shore I'd never make
I had felt-lined boots on my feet and it was cold in Cranberry Lake

The ice had been out a week at most and the water was cold as hell
So I grabbed the canoe and tried to hold on, but my fingers wouldn't work too well

Kick was on his way by then, 50 yards closer towards the shore
Staying with the boat was certain death and I didn't need to know anymore

So I struck out swimming the best I could, with felt-lined boots on my feet
The only thing keeping me up by then was a hold on a floatation seat

"Bill" says I, "I'm going to die for the water is taking its toll"

Davey Jones wouldn’t have our bones, but now it was exposure to the chill
Your can be shot in the head and not be as dead as hypothermia can kill

Up the bank we staggered and fell toward a cabin that was near
The door was locked and battened up tight but our minds just weren’t too clear

Our weight and our sinew we threw at it, but the door refused to yield
An all the while we’d been battering away, the window I’d been trying to shield

‘A stick I’ve got to find” Bill said, “that window I’ve got to shatter”
So I broke the window with my fist and opened the door I’d tried to batter

Haberdasher’s delight greeted us as we looked around the place
There were enough dry goods there to outfit half the human race

We stripped the clothes from our chests and put on blankets we found
There was firewood and kindling for the stove and there had to be some matches around

We looked on the table and we looked on the shelves and we looked on the floor as well
Four books of matches we finally discovered and they were obvious as hell

We stuffed the stove with kindling and tried to light a match
Try as we might, the matches were wet and we couldn’t get them to scratch

One down and three to go is what the bookmaker said
Be we were shaking uncontrollably and were more than a quarter dead

The second book I lit the whole thing and coaxed a lamp to light
The lamp glowed poorly at first but finally began to burn bright

A kerosene lantern is a wonderful thing because it is sure to brighten the scene
Also, if you are starting a fire there is always the kerosene

But Kick and I on book three had yet to discover that
Blindly groping forward, our minds ignored the fact

It struck, as we finished book three, that the end came after four
If we didn’t have a fire by then we’d be cold forevermore

My fingers gave out after that because they wouldn’t grip a match
Besides, you have to rendezvous with the cover to give the bastard a scratch

Book four was halfway through and the end was looking sad
Bill had an idea then and he thought it didn’t sound too bad

“Kerosene burns” is what he said, “it’s been known to start a fire”

I wanted him to die content so I didn't call him a liar

But he willed a match to light and threw it in the stove
It was cold in Cranberry Lake that day, but there was fire off Deremo Cove

**After viewing retrace route to Route 3, then turn left on Route 3**. At this juncture late in the day, the remainder of the trip will be directly back to Alexandria Bay and dinner. Depending on the number of those traveling in private conveyances and following Champlain's map, there should be enough to go around, and with any kind of luck, seconds.

203.4 Remains of Jones and Laughlin open pit mine on right side. Magnetite. Largest open pit mine east of the Mesabi Range in Minnesota.

205 Village of Star Lake.

212.5 Niagara Mohawk Power Dam on right.

**213.7 Turn right (north) on NY Rt. 58.**

236.6 **Turn left (south) on to US Rt. 11 in Village of Gouverneur** (birth place of Beechnut). The village was named after Gouverneur Morris.

254 **Turn right (north) on to NY Rt. 26 in Village of Philadelphia** (known locally as the Village of Brotherly Love).

260.6 **Turn right (east) on County Route 193**.

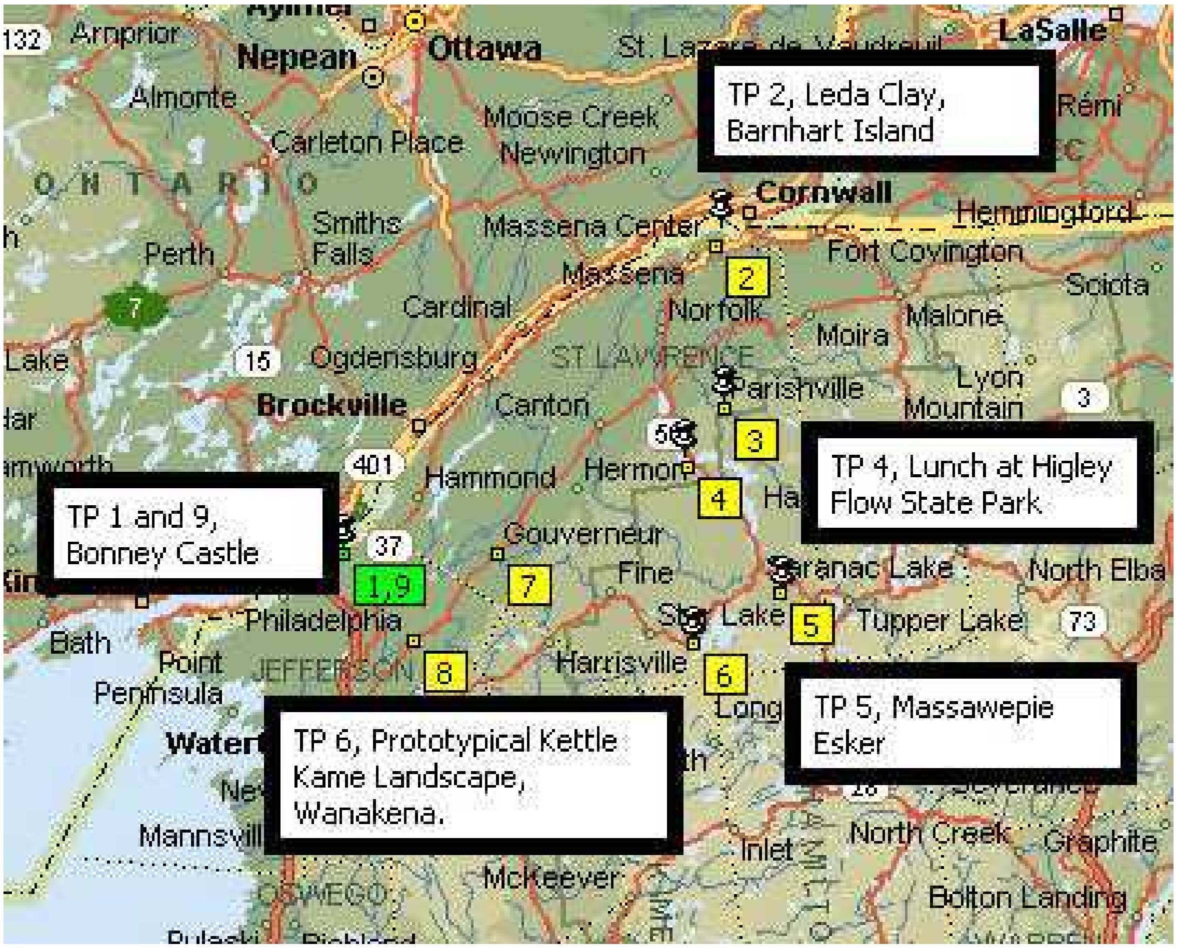
261.4 **Turn right on NY Rt. 26.**

271.8 Alexandria Bay

272.6 Bonnie Castle

**Appendix 0.00, Distribution of Stops and Index to Appendices**

**Distribution of Stops**




## Index to Appendices

Appendix 1, Acknowledgements
Appendix 2, Bedrock Geology
Appendix 3, Surficial Geology
Appendix 4, OSD's and Pedon Descriptions
Appendix 5, Laboratory Data
Appendix 6, Photographs
Appendix 7, Photographs
Appendix 8, *Soils Developed in Sediments from Late Quaternary Water Bodies in Northern New York*
Appendix 9, *New Mountains from Old Rocks*

**Appendix 1.**

# ACKNOWLEDGEMENTS


## Photo Credits

Cover Photographs:

- Upper Left: Thousand Islands: Courtesy 1000 Islands International Tourism Council.
- Upper Right: Adirondack Lake in Winter—S. Indrick.
- Middle Left: Contorted bedding in Adams Sand--S. Carlisle.
- Middle Right: Adirondack Lake in Fall--S. Carlisle.
- Lower Left: Beach Plains Church, S. of Canton; Beach Marking Water Plane for Lake Iroquois—S. Carlisle
- Lower Right: Colton Profile—S. Carlisle.
-

**Image of Ottawa Indian, page 3 from a wood cut, entitled: Noble Indien de la Nation Ottawa *in* the National Archives of Canada. Actual image downloaded off of website: canadianheritage.org/reproductions/20045.htm.**

Photographs in Appendix 6 and 7 by Steve Indrick and Steve Carlisle

Field work: Steve Carlisle, Steve Indrick, Ed Stein.

Editing of text by Deborah Carlisle.

Discussion of Leda Clay by Jan Aylsworth, Terrain Sciences Division, Geological Survey of Canada.

Dr. Neal O'Brian, SUNY, Potsdam State College contributed towards the text on quick clays. Some paragraphs he wrote, others he edited. Any inaccuracies represent the author's own attempt to reduce the subject to simple language.

The committee that organized the 2002 Northeast Cooperative Soil Survey Conference consisted of Tyrone Goddard, Steve DeGloria, Steve Indrick, Gail Arrow, Ed Stein, Kathleen Carpenter, and Steve Carlisle. Directly or indirectly they all share some responsibility for this guidebook.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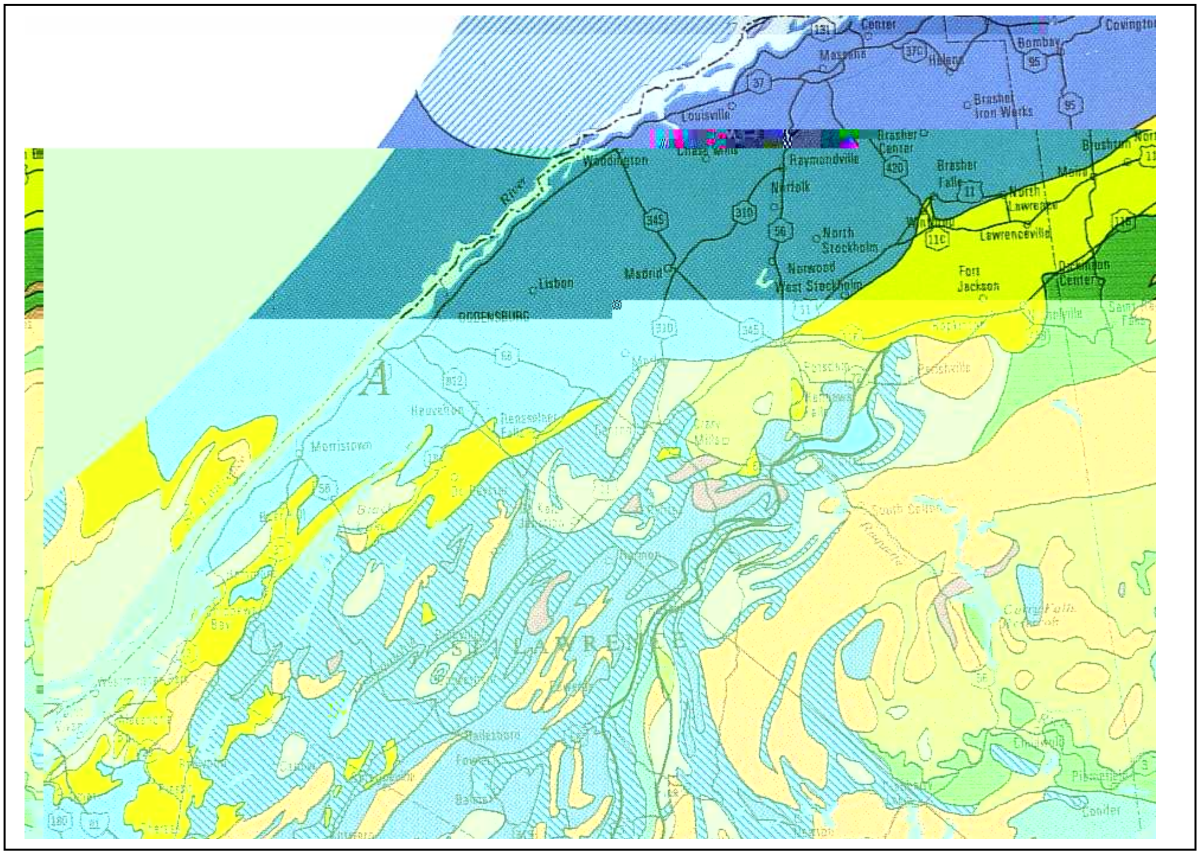
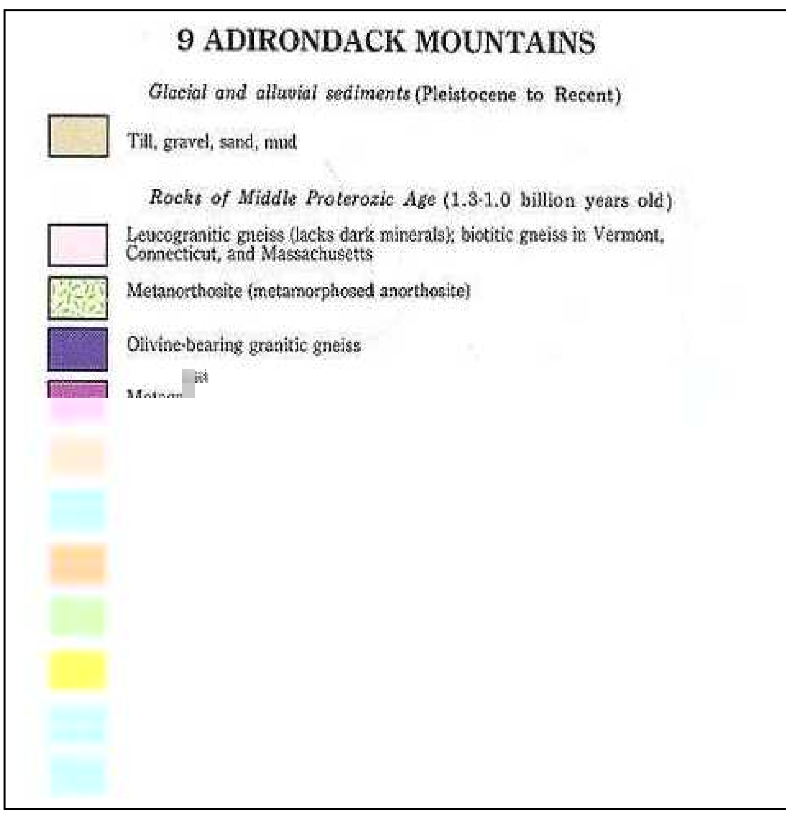
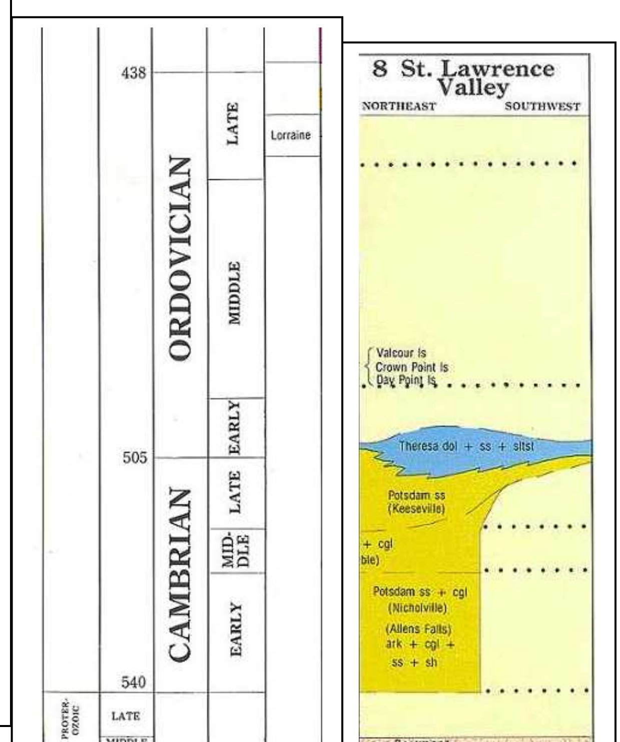
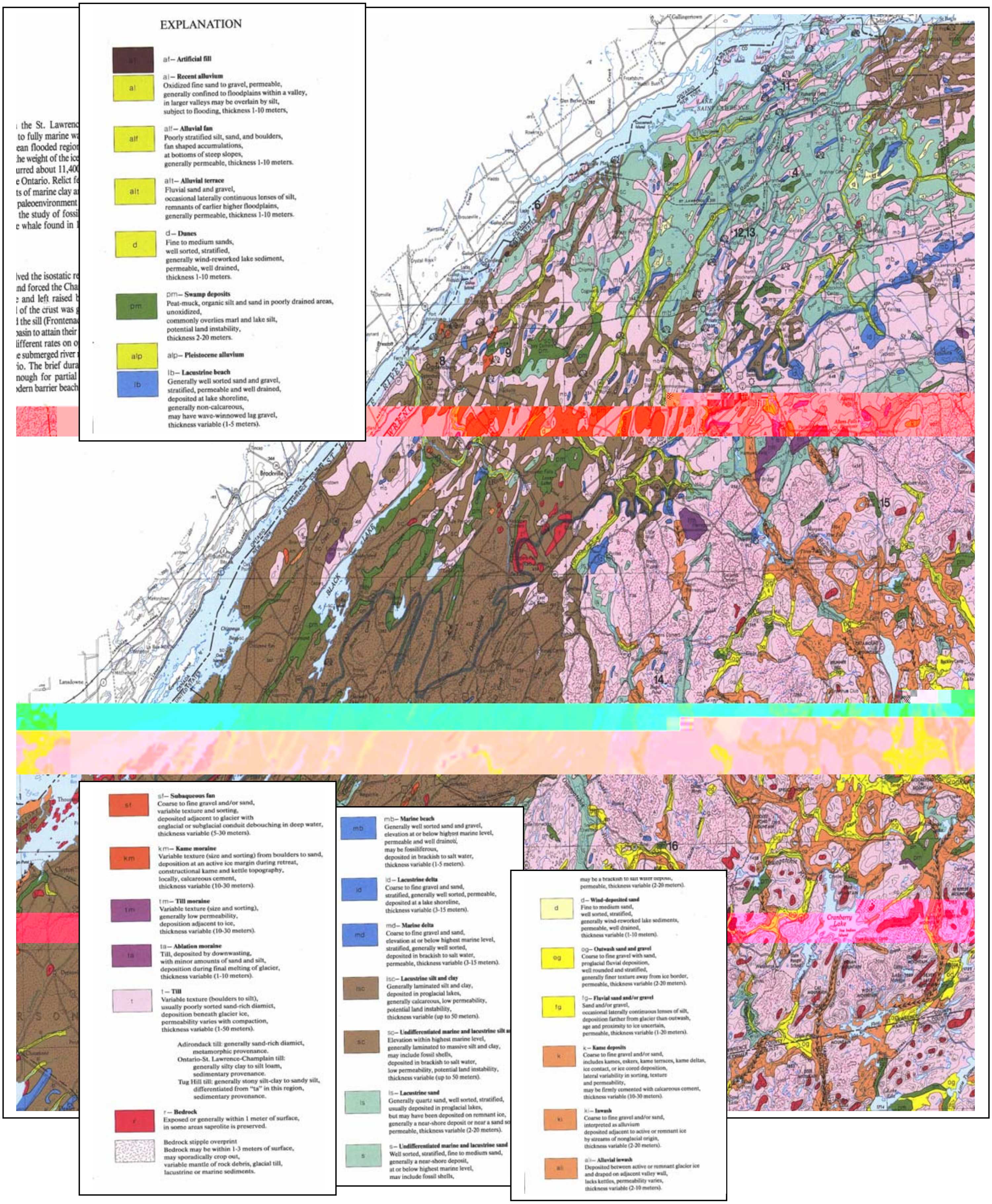
**Appendix 2**, **Bedrock Geology (Rodgers, et. al. 1990)**



**Appendix 3, Surficial Geology (Cadwell, et. al., 1990)**



## Appendix 4---Selected Official Series Descriptions, and Typifying Pedons

Official Series Description - ADIRONDACK Series
LOCATION ADIRONDACK NY+NH

Established Series
Rev. SCC-SWA
7/94

# ADIRONDACK SERIES

The Adirondack Series consists of very deep to bedrock, somewhat poorly drained, loamy soils overlying compact glacial till. They are in shallow depressions, on foot-slopes, and along drainageways on till plains in uplands and mountainous areas. Stones and boulders are common on the surface. Slope ranges from 0 to 15 percent. The mean annual temperature is 42 degrees F, and mean annual precipitation is 42 inches.
**TAXONOMIC CLASS**: Coarse-loamy, mixed, frigid Typic Epiaquods
**TYPICAL PEDON**: Adirondack fine sandy loam, on a 3 percent west facing slope that is extremely bouldery on the surface and is vegetated with balsam fir, white pine and eastern larch. (Colors are for moist soil unless otherwise indicated).

**Oi**--0 to 2 inches; dark reddish brown (5YR 2/2) partially decomposed forest litter, dark brown (7.5YR 4/2) dry; many fine roots; very strongly acid; abrupt wavy boundary. (0 to 3 inches thick.)

**Oa**--2 to 3 inches; black (N 2/0), very dark gray (5YR 3/1) dry, sapric material; about 40 percent unrubbed fibers, 10 percent rubbed; moderate medium and fine granular structure; friable, slightly sticky; many fine and few medium and coarse roots; extremely acid; abrupt wavy boundary. (0 to 3 inches thick.)

**A**--3 to 8 inches; black (N 2/0), very dark gray (5YR 3/1) dry, fine sandy loam; weak fine and medium subangular blocky structure; friable; many fine and medium roots; 10 percent rock fragments, mostly cobbles and stones; very strongly acid; abrupt smooth boundary. (0 to 8 inches thick.)

**E**--8 to 10 inches; gray (5YR 6/1) stony fine sandy loam; weak medium subangular blocky structure; friable; common fine roots; many fine distinct reddish brown (5YR 5/4) soft masses of Fe oxides; 20 percent rock fragments, mostly stones and cobbles; strongly acid; clear smooth boundary. (0 to 3 inches thick.)

**Bh**--10 to 13 inches; dark reddish brown (5YR 3/2) stony fine sandy loam; weak medium subangular blocky structure; friable; many fine and common medium roots; many fine vesicular pores; many fine distinct reddish brown (5YR 5/4) soft masses of Fe oxides; 25 percent rock fragments, mostly stones and cobbles; strongly acid; clear wavy boundary. (0 to 7 inches thick.)

**Bhs**--13 to 17 inches; dark reddish brown (5YR 3/3) stony loam; weak medium subangular blocky structure; friable; few fine and few medium roots; few fine vesicular pores;

few fine prominent brown (7.5 YR 5/4) soft masses of Fe oxides; 25 percent rock fragments, mostly stones and cobbles; strongly acid; gradual wavy boundary. (0 to 5 inches thick.)

**Bs--**17 to 22 inches; reddish brown (5YR 4/4) stony sandy loam; weak medium subangular blocky structure; friable; few fine roots; few fine vesicular pores; few fine distinct dark reddish brown (5YR 3/2) areas of Fe depletion; 25 percent rock fragments, mostly stones and cobbles;

strongly acid or moderately acid. Some pedons have a thin C horizon above the Cd horizon.
COMPETING SERIES:>(See remarks) This includes the
Wilmington soils have Bh horizons thicker than 7 inches.<P>
Similar series include the Brayton, Cabot, Kawbawgam, Lyme, Monico, Peacham, Suny, Westbury, Brayton, Cabot, Lyme, Peacham, and Suny soils do not have a spodic horizon. Kawbawgam and Monico soils do not have an umbric epipedon. Westbury soils have a fragipan horizon.
GEOGRAPHIC SETTING: Adirondack soils are nearly level to sloping soils in slightly concave areas and shallow drainage ways of glaciated uplands. Slopes range from 0 to 15 percent, but are dominantly 0 to 8 percent. The soils formed in Wisconsin age glacial till derived mainly from igneous and meta-igneous rocks. Mean annual precipitation ranges from 35 to 50 inches; mean annual temperature ranges from 40 to 45 degrees F; and the mean annual frost-free days ranges from 90 to 130 days. Elevation ranges from 600 to 2200 feet above sea level.
GEOGRAPHICALLY ASSOCIATED SOILS: Adirondack soils are commonly associated with the well drained Potsdam, Berkshire, Becket, and the moderately well drained
Crary, Skerry, Sunapeesoils that are on higher topographic positions. Also associated are the very poorly drained Tughill,soils and the poorly drained
Lyme soils that have more friable substratums.
DRAINAGE AND PERMEABILITY: Somewhat poorly drained. Runoff is slow to medium. Permeability is moderate in the layers above the substratum and slow in the substratum.

Diagnostic horizons and other features recognized in the typical pedon are as follows1. Umbric epipedon - from 0 to 8 inches (Oi, Oa and A horizons).
2. Spodic horizon - from 10 to 22 inches (Bh, Bhs and Bs horizons).
3. Epiaquods great group - redoximorphic features in the albic or spodic horizons and within 20 inches of the mineral soil surface; evidence of a perched water table on the Cd horizon.
4.Redoximorphic Features - Fe depletions, Fe concentrations, reduced matrices which are evidence of aquic conditions (E, Bh, Bhs, Bs and Cdg horizons).

Soil Interpretation Record Number: NY0408, NY0173
ADDITIONAL DATA: Engineering test data, and characterization data are available for Oneida County, New York for pedon S84NY065-5 from the Cornell University Soil Survey Laboratory.

National Cooperative Soil Survey
U.S.A.

# ADJIDAUMO SERIES

**TAXONOMIC CLASS** Fine, mixed, nonacid, frigid Mollic Endoaquepts
**TYPICAL PEDON**: Adjidaumo silty clay, on a 1 percent concave northeast-facing slope in a pasture. (Colors are for moist soil unless otherwise stated.)

**Ap**--0 to 8 inches; very dark gray (10YR 3/1) silty clay, gray (10YR 5/1) dry; weak fine subangular blocky structure; friable, sticky; many very fine and medium roots; many fine and medium interstitial pores; common fine distinct yellowish brown (10YR 5/8) soft masses of Fe oxides; less than 1 percent gravel; neutral; abrupt smooth boundary. (7 to 10 inches thick)

**Bg1**--8 to 18 inches; gray (N 6/0) silty clay; weak fine and medium subangular blocky structure; friable, sticky; few fine and very fine roots; few medium vesicular pores and few fine and medium interstitial pores; many coarse prominent yellowish brown (10YR 5/6) soft masses of Fe oxides; less than 1 percent gravel; neutral; gradual wavy boundary.
Bg2--18 to 27 inches; gray (N 5/0) clay; weak fine subangular blocky structure; friable, sticky; few fine roots; common fine and very fine vesicular and few fine tubular pores; many medium distinct yellowish brown (10YR 5/4) soft masses of Fe oxides, and many coarse faint grayish brown (10YR 5/2) areas of Fe depletion; less than 1 percent gravel; neutral; clear wavy boundary. (Combined thickness of the Bg horizon is 17 to 38 inches.)

**Cg**-27 to 65 inches; gray (N 5/0) clay; massive; firm, sticky; very few fine roots; very few fine vesicular pores; many coarse prominent dark brown (10YR 4/3), and few medium distinct yellowish brown (10YR 5/4) soft masses of Fe oxides; less than 1 percent gravel; very slightly effervescent, mildly alkaline.

TYPE LOCATION: St. Lawrence County, New York; Town of Dekalb, 80 feet NE from a point on Gibbons Street that is 180 feet south of the junction of U.S. 11; USGS Rensselaer Falls topographic quadrangle; latitude 44 degrees 31 minutes 5 seconds N. and longitude 75 degrees 15 minutes 58 seconds W.

# BERKSHIRE SERIES

**TAXONOMIC CLASS**: Coarse-loamy, isotic, frigid Typic Haplorthods
**TYPICAL PEDON**: Berkshire fine sandy loam, very stony, on a 28 percent north facing slope in a forested area. (Colors are for moist soil.)
**grayish brown 1ep**--0 to15 incs; oderatedlydsecmpostedplanft mntetialecmpristed of -0 to50 inches thick)

**Ap**-10 to27 inches; dark brown .50YR 3/2) fine sandy loa; weak fine structure; very friabls; many fine medium and

57 to 10 inches thick)

grncular(structure; very friabls; many fine medium and coarse roots; 10 )Tj0 -1.132 TD

**sg1**-97 to 10 inches; darkreddwish brown .50YR25/4) fine sandy loa;

**Bs2**--10 to 14 inches; yellowish red (5YR 4/6) fine sandy loam; weak fine and medium granular structure; very friable; many fine and medium roots; 10 percent gravel; extremely acid; clear wavy boundary. (combined thickness of the Bs horizon is 2 to 13 inches)

**BC**--14 to 23 inches; yellowish brown (10YR 5/4) gravelly fine sandy loam; weak fine and medium granular structure; friable; many fine and few medium roots; 15 percent gravel; extremely acid; abrupt smooth boundary. (0 to 20 inches thick)

**C**--23 to 65 inches; light olive brown (2.5Y 5/4) gravelly fine sandy loam; massive; friable; few fine roots in upper 6 inches; 15 percent gravel; very strongly acid.

TYPE LOCATION: Franklin County, Massachusetts; Town of Rowe, 1/2 mile east-southeast of Monroe Bridge; about 100 feet south of Monroe Hill Road and about 50 feet east of powerline right of way, at an elevation of 1378 feet. Latitude 42 degrees 43 minutes 12 seconds N., longitude 72 degrees 55 minutes 56 seconds W., NAD 27.

# CROGHAN SERIES

**TAXONOMIC CLASS**: Sandy, isotic, frigid Aquic Haplorthods <P>
**TYPICAL PEDON**: Typical pedon of Croghan fine sand on a 2 percent northwest facing slope, in a wooded area.

**Oi**--0 to 1 inch; slightly decomposed plant material. (0 to 6 inches thick)

**A**--1 to 3 inches; very dark grayish brown (10YR 3/2) fine sand; weak fine granular structure; very friable; many very fine and fine, and common medium and coarse roots; 2 percent rock fragments; very strongly acid; clear wavy boundary. (0 to 6 inches thick)

E--3 to 5 inches; gray (7.5YR 5/1) fine sand; single grain; loose; many very fine and common fine, medium and coarse roots; 2 percent rock fragments; strongly acid; abrupt wavy boundary. (0 to 6 inches thick)
Bhs--5 to 8 inches; dark reddish brown (5YR 3/3) fine sand; weak fine and medium subangular blocky structure; friable; common very fine, fine, medium and few coarse roots; 20 percent ortstein nodules; 2 percent rock fragments; strongly acid; clear irregular boundary. (0 to 3 inches)

**Bs1**--8 to 14 inches; brown (7.5YR 4/4) fine sand; weak fine and medium subangular blocky structure; friable; common very fine, fine, medium and few coarse roots; 20 percent ortstein nodules; 2 percent rock fragments; strongly acid; clear wavy boundary.

**Bs2**--14 to 23 inches; dark yellowish brown (10YR 4/4) fine sand; weak medium subangular blocky structure; very friable; few very fine, fine, medium and coarse roots; 5 percent ortstein nodules; 2 percent rock fragments; strongly acid; gradual wavy boundary. (Combined thickness of the Bs horizon is 5 to 38 inches thick)

**BC**--23 to 29 inches; yellowish brown (10YR 5/4) sand; single grain and weak medium subangular blocky structure; loose and very friable; few very fine, fine, medium and coarse roots; 10 percent rock fragments; common coarse prominent strong brown (7.5YR 5/6) masses of iron accumulation and common medium distinct grayish brown (10YR 5/2) iron depletions; moderately acid; clear wavy boundary. (0 to 30 inches thick).

**C1**--29 to 42 inches; pale brown (10YR 6/3) sand; single grain; loose; 5 percent rock fragments; common fine prominent strong brown (7.5YR 5/8) masses of iron accumulation and common medium distinct gray (10YR 6/1) iron depletions; moderately acid; abrupt wavy boundary.

**C2**--42 to 45 inches; grayish brown (10YR 5/2) loamy fine sand with thin strata of fine sandy loam; massive; very friable; common medium prominent reddish brown (5YR 4/4) masses of iron accumulation; moderately acid; abrupt wavy boundary.

**C3**--45 to 72 inches; grayish brown (2.5Y 5/2) sand; single grain; loose; 6 percent rock fragments; common fine prominent yellowish brown (10YR 5/6) masses of iron accumulation; moderately acid.

TYPE LOCATION: Essex County, New York; Town of Wilmington; about 2850 feet east of the intersection of Perkins Road and Hardy Kilburn Road and about 900 feet southwest of Perkins Road, in a wooded area; USGS Lake Placid 15 minute topographic quadrangle, latitude 44 degrees 22 minutes 15 seconds N. and longitude 73 degrees 47 minutes 22 seconds W., NAD 27.

# DEFORD SERIES

**TAXONOMIC CLASS**: Mixed, frigid Typic Psammaquents
**TYPICAL PEDON**: Deford fine sand - with a slope of 1 percent in an area used for pasture. (Colors are for moist soil unless otherwise stated.)

**A**--0 to 4 inches; very dark gray (10YR 3/1) and dark grayish brown (10YR 4/2) fine sand, gray (10YR 5/1) and light brownish gray (10YR 6/2) dry; weak fine granular structure parting to single grain; very friable; many very fine and fine and few medium roots; neutral; abrupt wavy boundary. (0 to 5 inches thick)

**C1**--4 to 18 inches; light yellowish brown (10YR 6/4) (uncoated sand grains)fine sand; single grain; loose; few medium prominent strong brown (7.5YR 5/6) and strong brown (7.5YR 5/8) iron accumulations in root channels; few fine roots; slightly alkaline; gradual wavy boundary.

**C2**--18 to 32 inches; pale brown (10YR 6/3) (uncoated sand grains) fine sand; single grain; loose; few medium prominent yellowish brown (10YR 5/6) iron accumulations in root channels; slightly alkaline; gradual wavy boundary.

**Cg**--32 to 60 inches; grayish brown (10YR 5/2) (uncoated sand grains) fine sand; single grain; loose; slightly alkaline.

TYPE LOCATION: Chippewa County, Michigan; 600 feet south and 200 feet west of the northeast corner of sec. 8, T. 41 N., R. 3 E.

# DORVAL SERIES

**TAXONOMIC CLASS**: Clayey, mixed, euic, frigid Terric Haplosaprists
**TYPICAL PEDON**: Dorval muck, on a 1 percent slope in a depressional marshy area. (Colors are for moist soil).

**Oa1**--0 to 17 inches; black (N2/0) broken face, very dark gray (5YR 3/1) rubbed, sapric material; about 40 percent unrubbed fibers, 10 percent rubbed; moderate fine and medium granular structure; very friable; woody and herbaceous fibers; few fine and very fine roots; neutral; clear wavy boundary.

**0a2**--17 to 23 inches; very dark gray (5YR 3/1) broken face, dark reddish brown (5YR 3/2) rubbed, sapric material; about 50 percent unrubbed fibers, 10 percent rubbed; massive; friable; woody and herbaceous fibers; 2 percent woody fragments; neutral; clear wavy boundary. (The combined thickness of 0a horizons is 12 to 50 inches).

**Oe**--23 to 31 inches; dark brown (7.5YR 3/2) broken face; dark reddish brown (5YR 3/2) rubbed, hemic material; about 90 percent unrubbed fibers, 20 percent rubbed; massive; friable; woody and herbaceous fibers; 2 percent woody fragments; neutral; clear wavy boundary. (0 to 9 inches thick).

**2Cg**--31 to 72 inches, gray (5YR 5/1) silty clay; massive; slightly sticky, slightly plastic; neutral.

TYPE LOCATION: St. Lawrence County, New York; in the town of Lisbon, 300 feet south of a gravel pit, 1/2 mile east of Five Mile Line Road, 1/2 mile south of Nelson Road. 44 degrees, 45 minutes, 16 seconds, north latitude and 75 degrees, 21 minutes, 05 seconds west longitude.

# DUXBURY SERIES

**TAXONOMIC CLASS**: Coarse-loamy over sandy or sandy-skeletal, mixed, frigid Typic Haplorthods

**TYPICAL PEDON** Duxbury fine sandy loam, on a 30 percent slope in a wooded area. (Colors are for moist soil.)

**Oi**--2 to 1 inches; undecomposed litter of spruce needles.

**Oe**--1 to 0 inches; moderately decomposed needles and twigs.

**E**--0 to 5 inches; brown (7.5YR 5/2) gravelly fine sandy loam; weak very fine granular structure; very friable; many roots; 15 percent rock fragments; extremely acid; abrupt irregular boundary. (0 to 6 inches thick)

**Bh**--5 to 8 inches; very dusky red (2.5YR 2/2) silt loam; weak medium subangular blocky structure; very friable; many roots; 10 percent rock fragments; extremely acid; clear broken boundary.

**Bhs**--8 to 16 inches; dark reddish brown (5YR 3/4) gravelly fine sandy loam; weak medium subangular blocky structure; very friable; many roots; 15 percent rock fragments; very strongly acid; gradual wavy boundary. (Combined thickness of the Bh, Bhs, and Bs horizons is 4 to 16 inches.)

**BC**--16 to 25 inches; dark yellowish brown (10YR 3/4) gravelly fine sandy loam; massive very friable; common roots; 20 percent rock fragments; very strongly acid; abrupt irregular boundary. (0 to 10 inches thick)

**2C**--25 to 65 inches; gray (5Y 5/1) and pale brown (10YR 6/3) very gravelly sand; single grain; loose; 48 percent rock fragments; strongly acid.

TYPE LOCATION: Lamoille County, Vermont; Town of Hyde Park, LeClair Road, 1/4 mile west of junction of unnamed road and T7, 2.65 miles north of junction of T16 and T7

# GRENVILLE SERIES

**TAXONOMIC CLASS**: Coarse-loamy, mixed, superactive, frigid Typic Eutrudepts
**TYPICAL PEDON**: Grenville fine sandy loam, in an unimproved pasture on a 3 percent slope at 340 feet elevation. (Colors are for moist soil unless otherwise stated.)

**A**-- 0 to 5 inches; very dark grayish brown (10YR 3/2) fine sandy loam; moderate fine and medium granular structure; friable; many fine and few medium roots; 5 percent gravel; moderately acid; clear irregular boundary. (4 to 10 inches thick)

**Bw1**-- 5 to 15 inches; yellowish brown (10YR 5/6) fine sandy loam; streaks of A material following some vertical macropores; weak medium and coarse subangular blocky structure; friable; many very fine and common fine roots; many fine vesicular and tubular pores and few medium pores; 10 percent gravel; moderately acid; clear wavy boundary.

**Bw2**-- 15 to 26 inches; brown (10YR 4/3) fine sandy loam; very weak coarse prismatic structure parting to moderate fine and medium subangular blocky; friable; common fine roots; common fine and medium tubular pores and many fine vesicular pores; few faint clay films in pores and on faces of peds; 10 percent gravel; common medium faint dark yellowish brown (10YR 4/4) and few fine distinct yellowish brown (10YR 5/6) masses of iron accumulation; slightly acid; clear wavy boundary. (Combined thickness of the Bw horizon is 8 to 30 inches.)

**BC**-- 26 to 37 inches; brown (10YR 5/3) and pale brown (10YR 6/3) fine sandy loam; very weak medium and coarse subangular blocky structure; firm; few fine roots; common fine and medium tubular pores; 10 percent gravel, 2 percent cobbles; few common medium distinct brown (7.5YR 4/4) and common medium faint dark yellowish brown (10YR 4/4) masses of iron accumulation; neutral; gradual wavy boundary. (0 to 15 inches thick)

**Cd**-- 37 to 70 inches; grayish brown (2.5Y 5/2) sandy loam with few small pockets of sand; massive; firm; common fine and medium tubular pores; 10 percent gravel, 2 percent cobbles; few medium faint yellowish brown (10YR 5/4) masses of iron accumulation; slightly effervescent; slightly alkaline. <P>
**TYPE LOCATION**: St. Lawrence County, New York; Town of Potsdam, in a pasture 72 feet north 66 degrees east from a point on a tractor trail that is 600 feet west on the trail from the junction of County Road 108. This junction is .4 mile south on County Road 108 from Burnhams Corners, just over a bridge; USGS West Potsdam, NY topographic quadrangle; Latitude 44 degrees, 42 minutes, 03 seconds N. and Longitude 75 degrees, 05 minutes, 00 seconds W., NAD 1927.

# HANNAWA SERIES

**TAXONOMIC CLASS:** Loamy, mixed, active, frigid Lithic Endoaquolls
**TYPICAL PEDON:** Hannawa loam, on a 1 percent southeast-facing slope in an abandoned field. (Colors are for moist soil unless otherwise noted.)
**Ap**--0 to 8 inches; very dark grayish brown (10YR 3/2) loam, grayish brown (10YR 5/2) dry; few medium distinct yellowish brown (10YR 5/6) mottles; weak medium granular structure; friable; many fine and medium roots; 5 percent gravel; neutral; abrupt smooth boundary. (4 to 10 inches thick)

**Bw**--8 to 14 inches; light yellowish brown (2.5Y 6/4) fine sandy loam; common fine distinct brownish yellow (10YR 6/8) mottles and common coarse prominent dark brown (7.5YR 3/2) mottles; moderate medium subangular blocky structure; friable; few fine and medium roots; many fine and medium, and few coarse tubular pores; 10 percent gravel, 2 percent cobbles and large channers; neutral; clear smooth boundary. (0 to 10 inches thick)

**Bg**--14 to 19 inches; grayish brown (2.5Y 5/2) gravelly fine sandy loam; many medium faint dark brown (10YR 4/3) and brown (10YR 5/3) mottles and few fine distinct strong brown (7.5YR 5/6) mottles; weak medium subangular blocky structure; common medium and coarse tubular pores and common fine and medium vesicular pores; 20 percent gravel; neutral; abrupt smooth boundary. (5 to 10 inches thick)

**R**--19 inches; hard dolomitic limestone.

**TYPE LOCATION:** St. Lawrence County, New York; town of Potsdam, 132 feet south, 22 degrees east of a point on the north side of Hoadley Road that is .6 mile northeast of the junction of Hoadley Road and Baker Road, 44 degrees 42 minutes 18 seconds North Latitude, 75 degrees 06 minutes 34 seconds West Longitude.

# Heuvelton Series

**TAXONOMIC CLASS:** Fine, mixed, active, frigid Aquic Hapludalfs
**TYPICAL PEDON:** Heuvelton silty clay loam -- on a 5 percent north-west facing slope in a hayfield. (Colors are for moist soil.)

**Ap**--0 to 7 inches; brown (10YR 4/3) silty clay loam; moderate very fine and fine granular and moderate medium subangular blocky structure; friable; many fine and few medium roots; common fine vesicular and few fine and medium tubular pores; strongly acid; abrupt smooth boundary. (5 to 9 inches thick)

**BE**--7 to 11 inches; brown (10YR 5/3) silty clay; moderate fine and medium angular blocky structure; friable; many fine and few medium roots; common fine vesicular and common fine and medium tubular pores; few faint clay films in pores; common fine faint yellowish brown (10YR 5/4) masses of iron accumulation; strongly acid; clear smooth boundary. (0 to 4 inches thick.)

**Bt**--11 to 22 inches; brown (10YR 4/3) clay; moderate fine and medium subangular blocky structure; friable; common fine roots; many fine vesicular and common fine and medium tubular pores; common distinct brown (10YR 5/3) clay films on faces of peds and in pores; many coarse distinct yellowish brown (10YR 5/6) masses of iron accumulation and few medium faint grayish brown (10YR 5/2) iron depletions; moderately acid; clear wavy boundary. (10 to 27 inches thick)

**C1**--22 to 40 inches; brown (7.5YR 4/4) silty clay loam; yellowish brown (10YR 5/4) faces of peds; strong fine and medium platy structure with occasional weak coarse prisms; firm; few fine and medium roots; few fine and medium vesicular and tubular pores, few macro pores; neutral; clear irregular boundary. (11 to 28 inches thick)

**C2**--40 to 72 inches; brown (10YR 5/3) varved silty clay loam with bands of very fine sandy loam; moderate medium platy structure; firm; few fine roots; few medium vesicular and few very fine and fine tubular pores; brown (10YR 4/3) silt coats on faces of peds; few fine distinct yellowish brown (10YR 5/4) masses of iron accumulation; strongly effervescent; moderately alkaline.

**TYPE LOCATION:** St. Lawrence County, New York; Town of Gouverneur, 80 feet north northwest of the junction of U.S. Route 11 and farm access road, 1 mile south of junction of Bristol Road and U.S. Route 11. USGS Richville, NY topographic quadrangle; latitude 44 degrees, 22 minutes, 58 seconds N. and longitude 75 degrees, 25 minutes, 4 seconds W. NAD 1927.

# HOGANSBURG SERIES

**TAXONOMIC CLASS**: Coarse-loamy, mixed, semiactive, frigid Aquic Eutrudepts
**TYPICAL PEDON**: Hogansburg gravelly loam, on a 4 percent slopes in a pasture. (Colors are for moist soil unless otherwise noted).

**Ap**--0 to 7 inches; very dark grayish brown (10YR 3/2) gravelly loam; light brownish gray (10YR 6/2) dry, crushed and smoothed; strong medium granular structure; very friable; many fine roots; 25 percent rock fragments; neutral; gradual wavy boundary. (6 to 11 inches thick).

**Bw1**--7 to 13 inches; brown (7.5YR 4/4) gravelly loam; weak medium subangular blocky structure; friable; common fine roots; common fine pores; 20 percent rock fragments; neutral; gradual wavy boundary.

**Bw2**--13 to 20 inches; yellowish brown (10YR 5/4) gravelly loam; very weak medium blocky structure; friable; few fine roots; common fine pores; 20 percent rock fragments; many medium faint yellowish brown (10YR 5/6) redoximorphic accumulations and common medium distinct grayish brown (10YR 5/2) redoximorphic depletions; neutral; clear wavy boundary. (combined thickness of Bw horizons is 5 to 30 inches).

**Cd1**--20 to 23 inches; dark grayish brown (10YR 4/2) gravelly fine sandy loam; massive; firm; few fine pores; 30 percent rock fragments; many medium distinct yellowish brown (10YR 5/6) redoximorphic accumulations; slightly effervescent; slightly alkaline; gradual wavy boundary.

Cd2--33 to 72 inches; grayish brown (10YR 5/2) very gravelly fine sandy loam; weak thick platy structure; firm; 40 percent rock fragments; common medium distinct yellowish brown (10YR 5/6) redoximorphic accumulations that decrease with depth; slightly effervescent, moderately alkaline.

TYPE LOCATION: Franklin County, New York; Town of Westville, 1.55 miles southwest of Westville and 100 feet west of Fort Covington-Westville town line road opposite T made by road to the east. USGS Fort Covington, NY topographic quadrangle; latitude 44 degrees, 56 minutes, 32 seconds N. and longitude 74 degrees, 26 minutes, 11 seconds W. NAD 1927.

Official Series Description - INSULA Series
LOCATION INSULA MN+NY
**Established Series**
**Rev. DHP-TAF-ELB**
02/2001

# INSULA SERIES

The Insula series consists of shallow, well drained soils that formed in 10 to 20 inches of loamy glacial till on bedrock controlled uplands. Slopes range from 0 to 35 percent. Permeability is moderately rapid. Mean annual precipitation is about 28 inches and the mean annual temperature is about 37 degrees F.
**TAXONOMIC CLASS**: Loamy, mixed, active, frigid Lithic Dystrudepts<P>
**TYPICAL PEDON**: Insula gravelly sandy loam with a 15 percent southwest facing slope under a jack pine forest at an elevation of 1,500 feet. (Colors are for moist soil unless otherwise stated.)

**0i**--1 1/2 to 1 inch; undecomposed and decomposing plant remains. (1/4 to 1 inch thick)
**0a**--1 to 0 inches; black (10YR 2/1); medium acid; mostly decomposed plant materials. (1/4 to 2 inches thick)

**E**--0 to 3 inches; gray (10YR 6/1) gravelly sandy loam; weak fine and medium subangular blocky structure; friable; about 25 percent rock fragments; medium acid; abrupt wavy boundary. (0 to 4 inches thick)

**Bw1**--3 to 6 inches; dark yellowish brown (10YR 3/4) gravelly sandy loam; weak medium subangular blocky structure and weak medium granular structure; friable; about 25 percent rock fragments; medium acid; clear smooth boundary.

**Bw2**--6 to 9 inches; dark brown (10YR 3/3) gravelly sandy loam; weak fine subangular blocky structure and weak medium granular structure; friable; about 25 percent rock fragments; medium acid; clear smooth boundary.

**Bw3**--9 to 12 inches; brown (10YR 4/3) gravelly sandy loam; weak fine subangular blocky structure and weak fine granular structure; friable; about 25 percent rock fragments; medium acid; clear smooth boundary. (Combined thickness of Bw horizons ranges from 6 to 13 inches.)
BC--12 to 15 inches; light olive brown (2.5Y 5/4) gravelly sandy loam; weak fine and medium subangular blocky structure; friable; about 25

percent rock fragments; medium acid; abrupt wavy boundary. (0 to 6 inches thick)

**2R**--15 inches; granite bedrock.

**TYPE LOCATION**: Lake County, Minnesota; NE1/4NE1/4SW1/4, sec. 24, T. 64 N., R. 49 W. (Section corners are not marked. Therefore, an accurate distance from a section corner cannot be given.)
**RANGE IN CHARACTERISTICS**: Thickness of solum and depth to bedrock ranges from 10 to 20 inches. Content of rock fragments, by volume, range from 10 to 35 percent in the surface and from 15 to 35 percent in the subsoil. Further, subhorizons in some pedons contain up to 45 percent of rock fragments. The rock fragments are of igneous and metamorphic origin with granites being a major component. Typically, gravel-size fragments are dominant, but cobble and boulder size fragments are significant. Stones and boulders within and on the soil range from 0 to 3 percent. In the solum, the average content of sand ranges from 35 to 65 percent and of clay from 4 to 18 percent. The fine earth fraction typically is sandy loam or fine sandy loam, but coarse sandy loam, loam, and silt loam are in some pedons. The solum ranges from very strongly acid to slightly acid.
Some pedons have an A horizon 1 to 4 inches thick. It has hue of 10YR or 7.5YR, value and chroma of 2 or 3.
The E horizon has hue of 10YR or 7.5YR, value of 4 to 6, and chroma of 1 or 2.
Some pedons have a thin Bs horizon.
The Bw horizon has hue of 7.5YR to 2.5Y, value of 3 to 5, and chroma of 3 to 6.
The bedrock is primarily granite or gabbro, but is metamorphic in some places.
**COMPETING SERIES**: These are the Barto and Hawksnest soils in the same family and the closely related Mesaba soils. The Barto soils lack an E horizon, typically have redder hue and bedrock is dominated by basalt. Hawksnest soils formed in till derived from sedimentary rock and typically are more acid. In addition, the rock fragments are of mostly sandstone, siltstone or shale. Mesaba soils have bedrock at a depth of 20 to 40 inches.
**GEOGRAPHIC SETTING**: These soils typically are on bedrock controlled ground moraines with plane to slightly convex slopes. Slope gradients are mainly 2 to 18 percent but range from 0 to to 35 percent. They formed in a 10 to 20 inch thick mantle of loamy glacial till of the Late Wisconsinan glaciation over bedrock that is dominantly granite, gabbro, and metamorphic. Mean annual temperature ranges from 35 to 44 degrees F, and mean annual precipitation ranges from 27 to 40 inches, but is dominantly 27 to 30 inches.
**GEOGRAPHICALLY ASSOCIATED SOILS**: These are the closely related Conic, Newfound and Quetico soils. They are on similar topographic positions. Conic soils are 20 to 40 inches deep and are on midslopes, Quetico soils are less than 10 inches deep and are on ridges and Newfound soils are greater than 40 inches deep and are on footslopes or concave midslopes.
**DRAINAGE AND PERMEABILITY**: Well drained. Surface runoff is medium to rapid. Permeability is moderately rapid.
**USE AND VEGETATION**: These soils are in mixed deciduous and coniferous forest. Major resource uses are related to recreation; timber, water, and wildlife. Major species of trees are quaking aspen, balsam fir, white spruce, jack pine, red pine, and eastern white pine.

**DISTRIBUTION AND EXTENT**: The Laurentian Shield of northeastern Minnesota and the St. Lawrence lowlands of northern New York. Moderately extensive.
**MLRA OFFICE RESPONSIBLE**: St. Paul, Minnesota
**SERIES ESTABLISHED**: Lake County, Minnesota in 1970. Source of name is Insula Lake in that county.
**REMARKS**: Diagnostic horizons and features are: Ochric horizon - from 0 to 3 inches (E horizon); Cambic horizon - from 3 to 15 inches (Bw and BC horizons); low base saturation.
**ADDITIONAL DATA**: Refer to MAES Central File Code No. 906, 908 and 916 for results of some laboratory analysis of other pedon of this series.

National Cooperative Soil Survey
U.S.A.

# MALONE SERIES

**TAXONOMIC CLASS**: Coarse-loamy, mixed, active, nonacid, frigid Aeric Epiaquepts
**TYPICAL PEDON**: Malone loam - on a 1 percent concave west facing slope in a young forest stand. (Colors are for moist soil.)

**Ap**-- 0 to 10 inches; very dark grayish brown (10YR 3/2) loam, light brownish gray (10YR 6/2) dry; weak fine subangular blocky structure; friable; common fine, many medium, and common coarse roots; 2 percent gravel and 3 percent cobbles; slightly acid; diffuse wavy boundary. (5 to 10 inches thick.)

**Bw**-- 10 to 19 inches; dark yellowish brown (10YR 4/4) gravelly fine sandy loam; weak medium and coarse subangular blocky structure; friable; common fine and many very fine roots; common fine and medium tubular pores; 25 percent gravel and 5 percent cobbles and stones; common medium faint yellowish brown (10YR 5/4) masses of iron accumulation, and few fine faint grayish brown (2.5Y 5/2) iron depletions; slightly acid; clear irregular boundary. (5 to 25 inches thick.)

**Bg**-- 19 to 25 inches; grayish brown (2.5Y 5/2) gravelly sandy loam; weak medium and coarse prismatic structure parting to weak medium subangular blocky; firm; few fine medium and coarse tubular pores; 10 percent gravel and 5 percent cobbles and stones; common medium faint light olive brown (2.5Y 5/4) masses of iron accumulation; very slightly effervescent in lower part; neutral; gradual irregular boundary. (0 to 14 inches thick.)

**Cd**-- 25 to 72 inches; light brownish gray (2.5Y 6/2) gravelly sandy loam; weak thick plate-like divisions, firm; few fine and medium tubular pores; 20 percent gravel; common medium distinct yellowish brown (10YR 5/6) masses of iron accumulation in upper part; slightly effervescent, slightly alkaline.

**TYPE LOCATION**: St. Lawrence County, New York; Town of Potsdam, 55 feet northwest of a point on Ellis Road that is 0.6 miles west of the junction of Ellis Road and W. Potsdam Road. USGS Morley, NY topographic quadrangle; Latitude 44 degrees, 40 minutes, 38 seconds N. and Longitude 75 degrees, 07 minutes, 49 seconds W., NAD 1927.

# OGDENSBURG SERIES

**TAXONOMIC CLASS**: Coarse-loamy, mixed, active, frigid Aquic Hapludolls
**TYPICAL PEDON**: Ogdensburg loam, on a 1 percent west-facing slope in a stand of second growth hardwoods. (Colors are for moist soil unless otherwise indicated.)

**Ap**--0 to 9 inches; black (10YR 2/1) loam, gray (10YR 5/1) dry; weak fine and medium subangular blocky structure; friable; many fine and medium roots; common fine and medium tubular pores; 5 percent gravel and channers; neutral; abrupt wavy boundary. (7 to 10 inches thick)

**Bw--**9 to 14 inches; dark yellowish brown (10YR 4/4) fine sandy loam; moderate medium subangular blocky structure; moderate medium subangular blocky structure; friable; common fine and medium roots; common fine tubular pores; 5 percent gravel and channers; common medium faint brown (10YR 4/3) redoximorphic iron masses and few fine faint dark grayish brown (10YR 4/2) redoximorphic depletions; neutral; clear wavy boundary. (4 to 9 inches thick)

**Bg--**14 to 21 inches; grayish brown (2.5YR 5/2) fine sandy loam, very dark grayish brown (10YR 3/2) faces of peds; weak fine angular blocky structure; friable; few fine roots; 10 percent gravel, 5 percent dolomitic sandstone pseudomorphs of gravel-size rock fragments; many medium prominent yellowish brown (10YR 5/6) and many fine faint olive brown (2.5Y 4/4) redoximorphic concentrations; neutral; clear wavy boundary. (4 to 12 inches thick)

**BCg**--21 to 24 inches; gray (N 5/0) and grayish brown (2.5Y 5/2) very gravelly fine sandy loam, light olive brown (2.5Y 5/4 and 5/6) faces of peds; massive; friable; 30 percent gravel and channers, 10 percent flags and cobbles; many medium distinct dark grayish brown (10YR 4/2) redoximorphic depletions; slightly alkaline, slightly effervescent; abrupt smooth boundary. (0 to 5 inches thick)

**2R**--24 inches; hard dolomitic sandstone bedrock with a thin veneer of saprolite.

**TYPE LOCATION**: St. Lawrence County, New York; Town of Oswegatchie, 900 feet northeast of a point on Stone Church Road that is 2650 feet southeast of the junction of New York Rt. 37. USGS Ogdensburg West, NY topographic quadrangle; latitude 44 degrees, 37 minutes, 36 seconds N. and longitude 75 degrees, 34 minutes, 28 seconds W. NAD 1927.

# POTSDAM SERIES

**TAXONOMIC CLASS**: Coarse-loamy, mixed, frigid Typic Haplorthods
**TYPICAL PEDON**: Potsdam very fine sandy loam, on a 15 percent slope in a wooded area. (Colors are for moist soil unless otherwise noted.)

**Oi**--3 inches of undecomposed forest litter. (0 to 3 inches thick)

**Oa**--0 to 3 inches; black (5YR 2/1) well decomposed leaves and twigs. (0 to 6 inches thick)

**E**--3 to 6 inches; pinkish gray (5YR 6/2) very fine sandy loam; weak fine subangular blocky structure; very friable; many fine pores; many coarse and many medium roots; 2 percent gravel; extremely acid; abrupt irregular boundary. (0 to 9 inches thick)

**Bh**--6 to 9 inches; dark reddish brown (5YR 2/2) silt loam; weak medium subangular blocky structure; friable; common fine pores; common fine and medium roots; 3 percent gravel; very strongly acid; gradual irregular boundary. (0 to 7 inches thick)

**Bs**--9 to 19 inches; reddish brown (5YR 4/4) and strong brown (7.5YR 5/6) silt loam; few fine distinct dark reddish brown (5YR 3/4) root stains; moderate medium subangular blocky structure; friable; common fine pores; common fine and medium roots; 3 percent gravel; very strongly acid; clear smooth boundary. (5 to 18 inches thick)

**2BC**--19 to 31 inches; light olive brown (2.5Y 5/4) gravelly sandy loam; very weak medium subangular blocky structure; friable; common fine pores; 10 percent fine gravel and 10 percent stones; very strongly acid; clear smooth boundary. (0 to 15 inches thick)

**2Cd**--31 to 72 inches; olive brown (2.5Y 5/4) gravelly sandy loam; massive; firm; few fine pores; 15 percent gravel and cobbles; strongly acid.

TYPE LOCATION:</B>  St. Lawrence County, New York, Town of Piercefield, 100 feet south of N.Y. Route 3 and 1 mile west of Conifer Road

# PYRITIES SERIES

**TAXONOMIC CLASS**: Coarse-loamy, mixed, active, frigid Dystric Eutrudepts
**TYPICAL PEDON**: Pyrities fine sandy loam, on a 4 percent convex south-facing slope in a field of alfalfa. (Colors are for moist soil unless otherwise indicated.)

**Ap--** 0 to 8 inches; dark brown (7.5YR 4/2) fine sandy loam, pinkish gray (7.5YR 6/2) dry; weak fine and medium subangular blocky structure; friable; common fine and medium roots; 10 percent gravel; neutral; abrupt wavy boundary. (7 to 10 inches thick)

**Bw1--** 8 to 14 inches; brown (7.5YR 4/4) fine sandy loam; weak fine and medium subangular blocky structure; friable; common fine and very fine roots; common fine and very fine tubular and vesicular pores; 10 percent gravel; neutral; gradual wavy boundary.

**Bw2--** 14 to 23 inches; brown (7.5YR 4/4) fine sandy loam; weak fine, medium and coarse subangular blocky structure; friable; common fine and very fine roots; many very fine and common fine vesicular and tubular pores; 10 percent gravel; neutral; gradual wavy boundary.

**Bw3**-- 23 to 30 inches; brown (7.5YR 5/4) fine sandy loam; weak medium and coarse subangular blocky structure parting to weak fine subangular blocky; very friable; few very fine and fine roots; many very fine and fine pores; common medium vesicular and tubular pores; 10 percent gravel; slightly alkaline; gradual wavy boundary. (Combined thickness of the Bw horizon is 13 to 35 inches.)

**BC--** 30 to 40 inches; brown (7.5YR 5/4) gravelly fine sandy loam; moderate medium platy structure parting to weak fine subangular blocky; friable; few fine roots; common fine pores; 20 percent gravel; slightly alkaline; gradual wavy boundary. (0 to 10 inches thick)

**C1**-- 40 to 44 inches; brown (7.5YR 5/4) gravelly fine sandy loam; massive parting to medium plate-like divisions along depositional planes; firm; common very fine and fine vesicular and tubular pores; 20 percent gravel; moderately alkaline; gradual wavy boundary.

**C2**-- 44 to 70 inches; brown (7.5YR 5/2) gravelly fine sandy loam; massive parting to medium plates along depositional planes; firm; 30 percent gravel; slightly effervescent; moderately alkaline.

TYPE LOCATION: St. Lawrence County, New York; town of Canton, near hamlet of Langdon Corners, 3.2 miles east of New York Rt. 11, 200 feet south of New York Rt. 68, 44 degrees, 34 minutes, 30 seconds North Latitude, 75 degrees, 05 minutes and 30 seconds West Longitude, NAD 1927.

LOCATION SUMMERVILLE        MI+NY WI
Established Series
Rev. JRC-WEF
01/99

# SUMMERVILLE SERIES

The Summerville series consists of shallow, well drained soils formed in loamy materials overlying limestone on ground moraines, end moraines, and glacial lake benches.  Permeability is moderate.  Slopes range from 0 to 45 percent.  Mean annual precipitation is about 30 inches, and mean annual temperature is about 43 degrees F.
TAXONOMIC CLASS: Loamy, mixed, active, frigid Lithic Eutrudepts
TYPICAL PEDON:  Summerville fine sandy loam on a southeast-facing slope of 3 percent in a forested area.  (Colors are for moist soil unless otherwise stated).

**Oi**--1 to 0 inches; undecomposed leaf litter.
**A**--0 to 2 inches; very dark grayish brown (10YR 3/2) fine sandy loam, grayish brown (10YR 5/2) dry; moderate fine granular structure; friable; many fine and medium and common coarse roots; slightly acid; clear wavy boundary.  (1 to 5 inches thick)

**Bw1**--2 to 9 inches; brown (7.5YR 4/4) fine sandy loam; moderate fine subangular blocky structure; friable; common medium and coarse and many fine roots; about 2 percent gravel; slightly acid; clear wavy boundary.

**Bw2**--9 to 16 inches; dark brown (7.5YR 4/4) fine sandy loam; moderate fine subangular blocky structure; friable; common medium and coarse and many fine roots; very dark grayish brown (10YR 3/2) organic stains; about 2 percent gravel and cobbles; slightly acid; abrupt wavy boundary. (The combined thickness of the Bw horizons is 3 to 16 inches.)

**2R**--16 inches; limestone.

TYPE LOCATION: Menominee County, Michigan; about 8 miles southwest of Powers; 2000 feet south, 100 feet east of northwest corner of sec. 27, T. 38 N., R. 27 W.
**RANGE IN CHARACTERISTICS**: The depth to limestone ranges from 10 to 20 inches. Reaction ranges from slightly acid to moderately alkaline throughout the pedon. Limestone stones, cobbles, channers, and flagstones ranging from about 0 to 35 percent by volume commonly are on the surface and mixed throughout the pedon. Volume of gravel ranges from 0 to 5 percent throughout. Texture throughout the pedon includes sandy loam, fine sandy loam, very fine sandy loam, silt loam, loam, or cobbly, flaggy or channery analogs of these textures.
Some pedons have a 4 to 9 inch thick Ap horizon. The A horizon or Ap horizon has hue of 5YR, 7.5YR, 10YR or is neutral; value of 2 or 3; and chroma of 0 to 3.
Some pedons have an E horizon that has hue of 7.5YR or 10YR, value of 5 to 7, and chroma of 2 or 3.
The Bw horizon has hue of 5YR, 7.5YR, or 10YR; value of 2 to 6; and chroma of 3 to 8.
Some pedons have a BC or C horizon up to 5 inches thick with hue of 5YR, 7.5YR, or 10YR; value of 3 to 6; and chroma of 2 to 4. A 1 to 3 inch calcareous layer immediately above the bedrock is in some pedons and it appears to be residuum weathered from the limestone.

**COMPETING SERIES**: There are no other series in this family. Closely related are the Glover, Peshekee, and Woodstock series. All of these have spodic horizons. In addition, Glover soils are underlain by schistose bedrock; Peshekee soils are underlain by igneous or metamorphic bedrock; and Woodstock soils are underlain by interbedded limestone and mica schist.
GEOGRAPHIC SETTING: The Summerville soils are on nearly level to steep ground moraines, end moraines, and glacial lake benches underlain at a shallow depth by limestone. Slope gradients typically are 2 to 12 percent but range from 0 to 45 percent. Mean annual temperature is estimated to range from 41 to 45 degrees F, and the mean annual precipitation ranges from 26 to 40 inches.
**GEOGRAPHICALLY ASSOCIATED SOILS**: The somewhat poorly drained Ensignsoils and poorly drained Ruse soils form a drainage sequence with Summerville soils. Well drained Longrie soils, somewhat poorly drained Sundell soils, and poorly drained Nahma soils are associated soils underlain by limestone at 20 to 40 inches. Well drained Chatham, Onaway and Trenary soils are near Summerville soils on higher positions on ground moraines. Excessively drained Alpena soils are in association on glacial lake benches and lake beaches.
**DRAINAGE AND PERMEABILITY**: Well drained. Runoff is slow to rapid depending on slope. Permeability is moderate.
**USE AND VEGETATION**: Most of this soil supports second growth woodland. Present vegetation consists of sugar maple, American basswood, quaking aspen, balsam fir, eastern white pine and northern white cedar.

Cleared areas are used for hay or pasture. Some areas are used for cropland.
**DISTRIBUTION AND EXTENT**: Northern part of lower Michigan; central and southeastern part of the Upper Peninsula of Michigan, northeastern Wisconsin and northern New York. The series is of moderate extent.
**MLRA OFFICE RESPONSIBLE**: Indianapolis, Indiana.
**SERIES ESTABLISHED**: Alpena County, Michigan, 1924.
**REMARKS**: Diagnostic horizons and features recognized in this pedon are: ochric epipedon - the zone from the surface to 2 inches (A horizon); cambic horizon - the zone from 2 to 16 inches (Bw1 and Bw2 horizons); a lithic contact of limestone at 16 inches (2R horizon).

National Cooperative Soil Survey
U.S.A.

# TUNBRIDGE SERIES

**TAXONOMIC CLASS**: Coarse-loamy, isotic, frigid Typic Haplorthods
**TYPICAL PEDON**: Tunbridge fine sandy loam, on a south-facing slope of 4 percent, in a rocky wooded area. (Colors are for moist soil.)

**A**--0 to 2 inches; dark brown (7.5YR 3/2) fine sandy loam; weak fine granular structure; very friable; many roots; 5 percent rock fragments; extremely acid; abrupt wavy boundary. (0 to 6 inches thick)

**E**--2 to 3 inches; grayish brown (10YR 5/2) fine sandy loam; weak fine granular structure, friable; many roots; 5 percent rock fragments; very strongly acid; abrupt broken boundary. (0 to 4 inches thick)

**Bh**--3 to 9 inches; dark reddish brown (5YR 3/4) loam; moderate medium angular blocky structure; friable; many roots; 10 percent rock fragments; very strongly acid; clear wavy boundary. (0 to 4 inches thick)

**Bs**--9 to 14 inches; yellowish brown (10YR 5/6) silt loam; weak medium subangular blocky structure; friable; many roots; 10 percent rock fragments; very strongly acid; clear wavy boundary. (0 to 16 inches thick.)

**C**--14 to 28 inches; dark grayish brown (2.5Y 4/2) gravelly fine sandy loam; massive; friable; common roots; 15 percent rock fragments; moderately acid; abrupt irregular boundary. (0 to 16 inches thick)

**R**--28 inches; mica schist and gneiss bedrock.

TYPE LOCATION: Lamoille County, Vermont; Town of Stowe; 0.25 mile east of Town Road #23 and 2.50 miles north of junction of Town Road #23 and Vermont Route 108; approximate latitude 44 degrees, 31 minutes, 00 seconds N., longitude 72 degrees, 42 minutes, 00 seconds W., NAD 27.

## Appendix 5, Laboratory Data.

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***   P R I M A R Y   C H A R A C T E R I Z A T I O N   D A T A   ***
S02NY-089-                            (ST LAWRENCE COUNTY, NEW YORK
)

                             (- - -TOTAL - - -)(- -CLAY- -)(- -SILT- -)(- - - -
- -SAND- -  - - - -)(-COARSE FRACTIONS(MM)-)(>2MM)
```


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***   P R I M A R Y   C H A R A C T E R I Z A T I O N   D A T A   ***
S02NY-089-                            (ST LAWRENCE COUNTY, NEW YORK
)
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PRINT DATE 06/05/02
SAMPLED AS    : ADAMS                 ;
REVISED TO    :                       ;

UNITED STATES DEPARTMENT OF AGRICULTURE
SSL - PROJECT  2P  17, (RP02NY057) FIELD TOUR
NATURAL RESOURCES CONSERVATION SERVICE
    - PEDON    2P  73, SAMPLES  2P  136-  137
NATIONAL SOIL SURVEY CENTER
    - GENERAL METHODS  1B1A, 2A1, 2B
SOIL SURVEY LABORATORY

LINCOLN, NEBRASKA 68508-3866

            -1--  -2--  -3--  -4--  -5--  -6--  -7--  -8--  -9--  -10-  -11-  -
12-  -13-  -14-  -15-  -16-  -17-  -18-  -19-  -20-

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----------------------------------------------------
                             (- - -TOTAL - - -)(- -CLAY- -)(- -SILT- -)(- - - -
- -SAND- -  - - - -)(-COARSE FRACTIONS(MM)-)(>2MM)
                              CLAY  SILT  SAND  FINE   CO3  FINE COARSE  VF
F     M     C    VC   - - - - WEIGHT - - - -   WT
SAMPLE     DEPTH   HORIZON     LT   .002  .05    LT    LT   .002  .02   .05
.10   .25    .5     1    2    5     20     .1- PCT OF
  NO.      (CM)               .002  -.05   -2  .0002  .002  -.02  -.05  -.10  -
.25  -.50   -1     -2   -5   -20   -75    75  WHOLE
                              <- - - - - - - - - - - - - PCT OF <2MM  (3A2) - - -
- - - - - - - - - ->  <- PCT OF <75MM(3B1)->  SOIL

 2P 136S  13- 33   Bs1         1.4  16.3  82.3              6.6   9.7   8.5
26.1  28.7  14.4   4.6   2     1    --      75   3
 2P 137S  33- 51   Bs2         1.0  12.8  86.2              5.3   7.5   6.2
22.9  31.3  18.4   7.4   3     3    --      81   6

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----------------------------------------------------
            ORGN TOTAL  EXTR TOTAL (- - DITH-CIT - -)(RATIO/CLAY)(ATTERBERG )(-
BULK DENSITY -) COLE (- - -WATER CONTENT - -)  WRD
             C     N      P    S       EXTRACTABLE          15   - LIMITS -
FIELD  1/3  OVEN WHOLE FIELD  1/10   1/3   15  WHOLE
 DEPTH                                 FE    AL    MN    CEC   BAR   LL    PI
MOIST  BAR  DRY   SOIL MOIST   BAR   BAR   BAR  SOIL
  (CM)      6A1d  6B4b  6S3f  6R3d  6C2i  6G7h  6D2h  8D1b  8D1b  4F1b   4F
4A5   4A1d  4A1h  4D1   4B4   4B1c  4B1c  4B2a  4C1b
            PCT   <2MM   PPM <- PERCENT  OF  <2MM -->            PCT <0.4MM
<- - G/CC - - -> CM/CM  <- - -PCT OF <2MM - -> CM/CM
```

```
 13- 33          0.148        0.02   1.4   0.7    --  7.21  6.43
9.0
 33- 51          0.076        0.01   1.0   0.6    --  6.00  5.70
5.7
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----------------------------------------------------
                              ***   P R I M A R Y   C H A R A C T E R I Z A T I
O N   D A T A   ***


S02NY-089-
PRINT DATE 06/05/02
SAMPLED AS    : ADAMS                 ;
USDA-NRCS-NSSC-SOIL SURVEY LABORATORY ; PEDON  2P  73, SAMPLE  2P  136-  137

            -1--  -2--  -3--  -4--  -5--  -6--  -7--  -8--  -9--  -10-  -11-  -
12-  -13-  -14-  -15-  -16-  -17-  -18-  -19-  -20-

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           (- NH4OAC EXTRACTABLE BASES -) ACID- EXTR (- - - -CEC - - -)  AL   -
BASE SAT- CO3 AS RES.        COND.(- - - -PH - - -)
             CA    MG    NA     K   SUM    ITY   AL   SUM   NH4-  BASES  SAT
SUM   NH4  CACO3 OHMS        MMHOS NAF  CACL2  H2O
 DEPTH      5B5c  5B5c  5B5c  5B5c BASES             CATS   OAC  + AL
OAC  <2MM   /CM         /CM        .01M
  (CM)      6N2j  6O2i  6P2g  6Q2g        6H5b  6G9e  5A3c  5A8e  5A3d  5G1b
5C3b  5C1b  6E1h  8E1          8I   8C1i  8C1j  8C1j
            <- - - - - - - - - - - - -MEQ / 100 G - - - - - - - - - - - ->  <- - -
- -PCT - - - ->                        1:2  1:1

 13- 33      0.2    --   0.3   0.1   0.6  15.3   6.1  15.9  10.1   6.7    91
4     6                        11.2   4.1   4.7
 33- 51      0.1    --   0.1   0.1   0.3  32.8   2.9  33.1   6.0   3.2    91
1     5                        11.2   4.4   5.0

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        ANALYSES:  S= ALL ON SIEVED <2mm BASIS
                              ***   P R I M A R Y   C H A R A C T E R I Z A T I
O N   D A T A   ***


S02NY-089-
PRINT DATE 06/05/02
SAMPLED AS    : ADAMS                 ;
USDA-NRCS-NSSC-SOIL SURVEY LABORATORY ; PEDON  2P  73, SAMPLE  2P  136-  137

            -1--  -2--  -3--  -4--  -5--  -6--  -7--  -8--  -9--  -10-  -11-  -
12-  -13-  -14-  -15-  -16-  -17-  -18-  -19-  -20-

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FRACTION INTERPRETATION:


MINERAL INTERPRETATION:
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RELATIVE PEAK SIZE:   5 Very Large   4 Large   3 Medium   2 Small   1 Very
Small   6 No Peaks

INTERPRETATION (BY HORIZON):


PEDON MINERALOGY
    BASED ON SAND/SILT:
    BASED ON CLAY:
    FAMILY MINERALOGY:
    COMMENTS:
                              ***   P R I M A R Y   C H A R A C T E R I Z A T I
O N   D A T A   ***
S02NY-089-                              (ST LAWRENCE COUNTY, NEW YORK
)

PRINT DATE 06/05/02
SAMPLED AS    : ADAMS                 ;

UNITED STATES DEPARTMENT OF AGRICULTURE
SSL - PROJECT  2P  17, (RP02NY057) FIELD TOUR
NATURAL RESOURCES CONSERVATION SERVICE
    - PEDON    2P  73, SAMPLES  2P  136-  137
NATIONAL SOIL SURVEY CENTER
    - GENERAL METHODS  1B1A, 2A1, 2B
SOIL SURVEY LABORATORY

LINCOLN, NEBRASKA 68508-3866

            -1--  -2--  -3--  -4--  -5--  -6--  -7--  -8--  -9--  -10-  -11-  -
12-  -13-  -14-  -15-  -16-  -17-  -18-  -19-  -20-

-------------------------------------------------------------------------------
-------------------------------------------------
           ACID OXALATE EXTRACTION  PHOSPHOUS   KCL  TOTAL  (- -WATER  CONTENT-
- )(- - - - WATER DISPERSIBLE - - - - ) MIN   AGGRT
             OPT  FE    SI    AL          CIT-  MN     C    0.06   1-    2-
15  <- - PIPETTE - - >< - HYDROMETER - > SOIL  STABL
             DEN                    RET   ACID              BAR   BAR   BAR
BAR  CLAY  SILT  SAND  CLAY  SILT  SAND   CONT  <5mm
SAMPLE  HZ  8J1d  6C9c  6V2c 6G12b  6S4e  6S5   6D3d  6A2f  4B1c  4B1f  4B1f
4B2b <- - - 3A2c - - -><- - - SML  - - -> 8F1   4G1b
  NO.   NO       <- P C T  o f < 2 m m -><- P P M  -->< - - - - - - - - - - P E
R C E N T   o f  < 2 m m - - - - - - - - ><20mm>< PCT>

 2P 136  1  0.49  0.75  0.12  0.87    64         2.1  3.06
 2P 137  2  0.18  0.46  0.21  0.88    61         1.0  1.43

-------------------------------------------------------------------------------
-------------------------------------------------
                        ***   S U P P L E M E N T A R Y   C H A R A C T E R I Z
A T I O N   D A T A   ***
S02NY-089-                              (ST LAWRENCE COUNTY, NEW YORK
)

PRINT DATE 06/05/02
SAMPLED AS    : ADAMS                 ;
REVISED TO    :                       ;

UNITED STATES DEPARTMENT OF AGRICULTURE
SSL - PROJECT  2P  17, (RP02NY057) FIELD TOUR
NATURAL RESOURCES CONSERVATION SERVICE
```

```
    - PEDON    2P  73, SAMPLES  2P  136-  137
NATIONAL SOIL SURVEY CENTER
    - GENERAL METHODS  (ENGINEERING FRACTIONS ARE CALCULATED FROM USDA FRACTION
SIZES)      SOIL SURVEY LABORATORY

LINCOLN, NEBRASKA 68508-3866

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----------------------------------------------------
                             E  N  G  I  N  E  E  R  I  N  G     P  S  D  A
CUMULATIVE CURVE FRACTIONS(<75mm)  ATTER- GRADATION
                           P E R C E N T A G E    P A S S I N G    S I E V E
USDA   LESS  THAN  DIAMETERS(mm) AT  BERG  UNI- CUR-
SAMPLE    DEPTH  HORIZON    3   2  3/2  1  3/4 3/8  4  10   40 200  20  5   2
1. .5  .25 .10 .05  60   50    10    LL PI FMTY VTUR
  No.     (In.)           <-----I N C H E S-----> <-N U M B E R-> <-MICRONS->
<--- MILLIMETER ---><--PERCENTILE--> <-PCT>  CU   CC
                             1   2   3   4   5   6   7   8   9  10  11  12  13
14  15  16  17  18  19    20    21   22 23   24   25

 2P 136S   5- 13   Bs1     100 100 100 100 100 100  99  97  72  22   8   4   1
93  79  51  25  17 0.31 0.243 0.025        12.7  1.8
 2P 137S  13- 20   Bs2     100 100 100 100 100  99  98  95  63  16   6   3   1
88  70  41  19  13 0.39 0.310 0.034        11.7  1.9
-------- -----------------------------------------------------------------------
----------------------------------------------------
           (  W  E  I  G  H  T    F  R  A  C  T  I  O  N  S  )   ( W E I G H
T   P E R   U N I T   V O L U M E   G/CC )(  VOID  )
            ---W H O L E    S O I L (mm)-  -<75 mm FRACTION--      ------WHOLE
SOIL------  -------<2 mm FRACTION-------  --RATIOS--
 DEPTH      >2 250 250  75  75  20   5      75  75  20   5         SOIL SURVEY
ENGINEERING  --SOIL SURVEY-- ENGINEERING  AT 1/3  BAR
 (In.)         -UP -75  -2 -20  -5  -2  <2  -2 -20  -5  -2  <2      1/3  OVEN
MOIST SATUR  1/3   15   OVEN  MOIST SATUR  WHOLE  <2
            <------PCT of WHOLE SOIL-----> <--PCT OF <75 mm->      BAR  -DRY
-ATED  BAR   BAR  -DRY        -ATED  SOIL   mm
            26  27  28  29  30  31  32  33  34  35  36  37  38  39   40    41
42    43    44    45    46    47    48    49    50

  5- 13      3  --  --   3  --   1   2  97   3  --   1   2  97      1.47
 13- 20      5  --  --   5  --   2   3  95   5  --   2   3  95      1.49
--------- ----------------------------------------------------------------------
----------------------------------------------------
                        ***  S U P P L E M E N T A R Y  C H A R A C T E R I Z
A T I O N  D A T A  ***


S02NY-089-
PRINT DATE 06/05/02
SAMPLED AS    : ADAMS                  ;
USDA-NRCS-NSSC-SOIL SURVEY LABORATORY ; PEDON  2P  73, SAMPLE  2P  136-  137

-------- -----------------------------------------------------------------------
----------------------------------------------------
           (  V  O  L  U  M  E    F  R  A  C  T  I  O  N  S  )(C/)(R A T I O S
to    C L A Y)( LINEAR EXTENSIBILITY )( W  R  D )
            ----W H O L E    S O I L (mm)   a t  1/3  B A R---(/N) --------<2
mm FRACTION-------  WHOLE SOIL  --<2 mm--  WHOLE  <2
 DEPTH      >2 250 250  75  75  20   5      2- .05- LT   PORES RAT  FINE  ---C
E C--   15   LEP   <-1/3 BAR to (PCT)--->  SOIL   mm
 (In.)         -UP -75  -2 -20  -5  -2  <2 .05 .002 .002 D   F -IO  CLAY   SUM
NH4-   BAR  1/3    15   OVEN   15   OVEN
```

```
            <---------------PCT of WHOLE SOIL---------------->           CATS
OAC   H2O  BAR    BAR  -DRY   BAR  -DRY  <--In/In->
            51  52  53  54  55  56  57  58  59  60  61  62  63  64   65    66
67    68    69    70    71    72    73    74    75

  5- 13      2  --  --   2  --   1   1  98  44   9   1  45              11.36
7.21  6.43
 13- 20      3  --  --   3  --   1   2  97  46   7   1  44              33.10
6.00  5.70
-------- ----------------------------------------------------------------------
----------------------------------------------------
           (  W E I G H T   F R A C T I O N S - C L A Y   F R E E )(-TEXTURE--
)(--P S D A(mm)---)(PH )(-ELECTRICAL)<              >
           (--W H O L E  S O I L--) (--<2 mm  F R A C T I O N ----
)(DETERMINED)(SAND  SILT  CLAY) CA-  RES-  CON-  <               >
 DEPTH      >2  75  20  2- .05- LT  ------SANDS-------  SILTS   CL  IN    BY
2-   .05-   LT   CL2  IST.  DUCT. <               >
 (In.)          -2  -2 .05 .002.002 VC  C   M   F   VF  C   F   AY FIELD  PSDA
.05   .002  .002 .01M  OHMS  MMHOS <               >
            PCT of >2mm+SAND+SILT > <------PCT of SAND+SILT-------><---<2 mm--
><---PCT of 2mm---><----- <2mm -----><--------------->
            76  77  78  79  80  81  82  83  84  85  86  87  88  89   90    91
92    93    94    95    96    97    98    99   100

  5- 13      3   3   3  81  16   1   5  15  29  26   9  10   7   1        LS
82.3  16.3   1.4   4.1
 13- 20      5   5   5  83  12   1   7  19  32  23   6   8   5   1        COS
86.2  12.8   1.0   4.4
-------- ----------------------------------------------------------------------
----------------------------------------------------



                              CLAY  SILT  SAND  FINE   CO3  FINE COARSE  VF
F     M     C    VC   - - - - WEIGHT - - - -   WT
SAMPLE     DEPTH   HORIZON     LT   .002  .05    LT    LT   .002  .02   .05
.10   .25    .5     1    2    5     20     .1- PCT OF
  NO.      (CM)               .002  -.05   -2  .0002  .002  -.02  -.05  -.10  -
.25  -.50   -1     -2   -5   -20   -75    75  WHOLE
                              <- - - - - - - - - - - - - PCT OF <2MM  (3A2) - - -
- - - - - - - - - - ->  <- PCT OF <75MM(3B1)->  SOIL

 2P 138S  10- 28   Bs          2.9  19.8  77.3              10.6   9.2   6.3
9.4  13.5  26.0  22.1  17    18    --      81  35
 2P 139S  10- 28   Bs          3.4  22.4  74.2           --  11.2  11.2   7.6
10.2  13.8  21.1  21.5  14    20    --      78  34

--------- ---------------------------------------------------------------------
----------------------------------------------------
            ORGN TOTAL  EXTR TOTAL (- - DITH-CIT - -)(RATIO/CLAY)(ATTERBERG )(-
BULK DENSITY -) COLE (- - -WATER CONTENT - -)  WRD
             C     N      P    S       EXTRACTABLE           15   - LIMITS -
FIELD  1/3  OVEN WHOLE FIELD  1/10   1/3   15  WHOLE
 DEPTH                                 FE    AL    MN    CEC   BAR   LL    PI
MOIST  BAR  DRY   SOIL MOIST   BAR   BAR   BAR  SOIL
  (CM)      6A1d  6B4b  6S3f  6R3d  6C2i  6G7h  6D2h  8D1b  8D1b  4F1b   4F
4A5   4A1d  4A1h  4D1   4B4   4B1c  4B1c  4B2a  4C1b
            PCT   <2MM   PPM <- PERCENT  OF  <2MM -->             PCT <0.4MM
<- - G/CC - - -> CM/CM  <- - -PCT OF <2MM - -> CM/CM

 10- 28          0.158        0.04   2.1   1.5    TR  6.79  4.66
13.5
```

```
 10- 28          0.129        0.04   0.3    --    --  5.56  3.09
10.5
--------- -----------------------------------------------------------------
----------------------------------------------------
                              ***  P R I M A R Y  C H A R A C T E R I Z A T I
O N   D A T A  ***

PRINT DATE 06/05/02
SAMPLED AS    : COLTON                ;
REVISED TO    :                       ;

UNITED STATES DEPARTMENT OF AGRICULTURE
SSL - PROJECT  2P  17, (RP02NY057) FIELD TOUR
NATURAL RESOURCES CONSERVATION SERVICE
    - PEDON    2P  74, SAMPLES  2P  138-  139
NATIONAL SOIL SURVEY CENTER
    - GENERAL METHODS  1B1A, 2A1, 2B
SOIL SURVEY LABORATORY

LINCOLN, NEBRASKA 68508-3866

            -1--  -2--  -3--  -4--  -5--  -6--  -7--  -8--  -9--  -10-  -11-  -
12-  -13-  -14-  -15-  -16-  -17-  -18-  -19-  -20-

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----------------------------------------------------S02NY-089-
PRINT DATE 06/05/02
SAMPLED AS    : COLTON                 ;
USDA-NRCS-NSSC-SOIL SURVEY LABORATORY ; PEDON  2P  74, SAMPLE  2P  138-  139

            -1--  -2--  -3--  -4--  -5--  -6--  -7--  -8--  -9--  -10-  -11-  -
12-  -13-  -14-  -15-  -16-  -17-  -18-  -19-  -20-

--------- -----------------------------------------------------------------
----------------------------------------------------
           (- NH4OAC EXTRACTABLE BASES -) ACID- EXTR (- - - -CEC - - -)  AL   -
BASE SAT- CO3 AS RES.       COND.(- - - -PH - - -)
             CA    MG    NA     K   SUM    ITY   AL   SUM   NH4-  BASES  SAT
SUM   NH4  CACO3 OHMS        MMHOS NAF  CACL2  H2O
 DEPTH      5B5c  5B5c  5B5c  5B5c BASES              CATS   OAC  + AL
OAC  <2MM   /CM         /CM        .01M
  (CM)      6N2j  6O2i  6P2g  6Q2g        6H5b  6G9e  5A3c  5A8e  5A3d  5G1b
5C3b  5C1b  6E1h  8E1         8I   8C1i  8C1j  8C1j
            <- - - - - - - - - - - - -MEQ / 100 G - - - - - - - - - - - ->  <- - -
- -PCT - - - ->                         1:2  1:1

 10- 28      0.8   0.1   0.2   0.1   1.2  29.0   2.5  30.2  19.7   3.7    68
4     6                         11.3   4.6   5.2
 10- 28      0.9   0.2   0.2   0.2   1.5         0.6   1.5  18.9   2.1    29
100     8                         10.3   4.6   5.2

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        ANALYSES:  S= ALL ON SIEVED <2mm BASIS
                              ***  P R I M A R Y  C H A R A C T E R I Z A T I
O N   D A T A  ***


S02NY-089-
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USDA-NRCS-NSSC-SOIL SURVEY LABORATORY ; PEDON  2P  74, SAMPLE  2P  138-  139
```

```
           -1--  -2--  -3--  -4--  -5--  -6--  -7--  -8--  -9--  -10-  -11-  -
12-  -13-  -14-  -15-  -16-  -17-  -18-  -19-  -20-

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FRACTION INTERPRETATION:


MINERAL INTERPRETATION:



RELATIVE PEAK SIZE:   5 Very Large   4 Large   3 Medium   2 Small   1 Very
Small   6 No Peaks

INTERPRETATION (BY HORIZON):


PEDON MINERALOGY
    BASED ON SAND/SILT:
    BASED ON CLAY:
    FAMILY MINERALOGY:
    COMMENTS:
                              ***   P R I M A R Y   C H A R A C T E R I Z A T I
O N   D A T A   ***
S02NY-089-                              (ST LAWRENCE COUNTY, NEW YORK
)

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NATURAL RESOURCES CONSERVATION SERVICE
    - PEDON    2P  74, SAMPLES  2P  138-  139
NATIONAL SOIL SURVEY CENTER
    - GENERAL METHODS  1B1A, 2A1, 2B
SOIL SURVEY LABORATORY

LINCOLN, NEBRASKA 68508-3866

           -1--  -2--  -3--  -4--  -5--  -6--  -7--  -8--  -9--  -10-  -11-  -
12-  -13-  -14-  -15-  -16-  -17-  -18-  -19-  -20-

------------------------------------------------------------------------------
---------------------------------------------------
           ACID OXALATE EXTRACTION  PHOSPHOUS   KCL  TOTAL  (- -WATER  CONTENT-
- )(- - - - WATER DISPERSIBLE - - - - ) MIN   AGGRT
             OPT  FE    SI    AL          CIT-  MN     C    0.06   1-    2-
15  <- - PIPETTE - - >< - HYDROMETER - > SOIL  STABL
             DEN                    RET   ACID               BAR   BAR   BAR
BAR  CLAY  SILT  SAND  CLAY  SILT  SAND   CONT  <5mm
SAMPLE  HZ  8J1d  6C9c  6V2c 6G12b  6S4e  6S5   6D3d  6A2f  4B1c  4B1f  4B1f
4B2b <- - - 3A2c - - -><- - - SML  - - -> 8F1   4G1b
  NO.   NO       <- P C T  o f < 2 m m -><- P P M  -><- - - - - - - - - - P E
R C E N T   o f  < 2 m m - - - - - - - - ><20mm>< PCT>

 2P 138  1  0.52  1.11  0.72  2.36    97         0.8  4.30
 2P 139  1  0.04  0.27  0.06  0.09    98         0.5  3.58
```

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------------------------------------------------------------------------------
----------------------------------------------------
                        ***  S U P P L E M E N T A R Y  C H A R A C T E R I Z
A T I O N  D A T A  ***
S02NY-089-                              (ST LAWRENCE COUNTY, NEW YORK
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    - PEDON    2P  74, SAMPLES  2P  138-  139
NATIONAL SOIL SURVEY CENTER
    - GENERAL METHODS  (ENGINEERING FRACTIONS ARE CALCULATED FROM USDA FRACTION
SIZES)      SOIL SURVEY LABORATORY

LINCOLN, NEBRASKA 68508-3866

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----------------------------------------------------
                             E  N  G  I  N  E  E  R  I  N  G     P  S  D  A
CUMULATIVE CURVE FRACTIONS(<75mm)  ATTER- GRADATION
                           P E R C E N T A G E    P A S S I N G    S I E V E
USDA   LESS  THAN  DIAMETERS(mm) AT  BERG  UNI- CUR-
SAMPLE    DEPTH  HORIZON    3   2  3/2  1  3/4 3/8  4  10   40 200  20  5   2
1. .5  .25 .10 .05  60   50    10    LL PI FMTY VTUR
  No.     (In.)           <-----I N C H E S-----> <-N U M B E R-> <-MICRONS->
<--- MILLIMETER ---><--PERCENTILE--> <-PCT>  CU   CC
                             1   2   3   4   5   6   7   8   9  10  11  12  13
14  15  16  17  18  19    20    21   22 23   24   25

 2P 138S   4- 11   Bs      100 100 100 100 100  91  82  65  32  17   9   5   2
51  34  25  19  15 1.57 0.974 0.024        65.1  3.7
 2P 139S   4- 11   Bs      100 100 100 100 100  91  81  67  36  20  10   5   2
53  38  29  22  17 1.43 0.881 0.021        69.5  2.4
-------- ---------------------------------------------------------------------
----------------------------------------------------
           (  W  E  I  G  H  T    F  R  A  C  T  I  O  N  S  )   ( W E I G H
T  P E R   U N I T  V O L U M E  G/CC )(  VOID  )
            ---W H O L E    S O I L (mm)-  -<75 mm FRACTION--      ------WHOLE
SOIL------  -------<2 mm FRACTION-------  --RATIOS--
 DEPTH      >2 250 250  75  75  20   5      75  75  20   5        SOIL SURVEY
ENGINEERING  --SOIL SURVEY-- ENGINEERING  AT 1/3  BAR
 (In.)         -UP -75  -2 -20  -5  -2  <2  -2 -20  -5  -2  <2      1/3  OVEN
MOIST SATUR  1/3   15   OVEN  MOIST SATUR  WHOLE  <2
            <------PCT of WHOLE SOIL-----> <--PCT OF <75 mm->      BAR  -DRY
-ATED  BAR   BAR  -DRY        -ATED  SOIL   mm
            26  27  28  29  30  31  32  33  34  35  36  37  38  39   40    41
42    43    44    45    46    47    48    49    50

  4- 11     35  --  --  35  --  18  17  65  35  --  18  17  65      1.71
  4- 11     33  --  --  33  --  19  14  67  33  --  19  14  67      1.70
--------- --------------------------------------------------------------------
----------------------------------------------------
                        ***  S U P P L E M E N T A R Y  C H A R A C T E R I Z
A T I O N  D A T A  ***


S02NY-089-
PRINT DATE 06/05/02
```

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SAMPLED AS    : COLTON                ;
USDA-NRCS-NSSC-SOIL SURVEY LABORATORY ; PEDON  2P  74, SAMPLE  2P  138-  139

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----------------------------------------------------
           (  V  O  L  U  M  E     F  R  A  C  T  I  O  N  S  )(C/)(R A T I O S
to    C L A Y)( LINEAR EXTENSIBILITY )( W  R  D )
            ----W H O L E     S O I L (mm)   a t  1/3  B A R---(/N) --------<2
mm FRACTION-------  WHOLE SOIL  --<2 mm--  WHOLE  <2
 DEPTH      >2 250 250  75  75  20   5      2- .05- LT   PORES RAT  FINE  ---C
E C--   15   LEP   <-1/3 BAR to (PCT)--->  SOIL   mm
 (In.)         -UP -75  -2 -20  -5  -2  <2 .05 .002 .002 D   F -IO  CLAY   SUM
NH4-   BAR  1/3    15   OVEN   15   OVEN
            <---------------PCT of WHOLE SOIL---------------->            CATS
OAC   H2O  BAR    BAR  -DRY   BAR  -DRY  <--In/In->
            51  52  53  54  55  56  57  58  59  60  61  62  63  64   65    66
67    68    69    70    71    72    73    74    75

  4- 11     22  --  --  22  --  12  11  78  32   8   1  35               10.41
6.79  4.66
  4- 11     21  --  --  21  --  12   9  79  32  10   1  36                0.44
5.56  3.09
-------- ---------------------------------------------------------------------
----------------------------------------------------
           (  W E I G H T   F R A C T I O N S - C L A Y   F R E E )(-TEXTURE--
)(--P S D A(mm)---)(PH )(-ELECTRICAL)<              >
           (--W H O L E  S O I L--) (--<2 mm  F R A C T I O N ----
)(DETERMINED)(SAND  SILT  CLAY) CA-  RES-  CON-  <              >
 DEPTH      >2  75  20  2- .05- LT  ------SANDS-------  SILTS   CL  IN    BY
2-   .05-   LT   CL2  IST.  DUCT. <              >
 (In.)          -2  -2 .05 .002.002 VC  C   M   F   VF  C   F   AY FIELD  PSDA
.05   .002  .002 .01M  OHMS  MMHOS <              >
            PCT of >2mm+SAND+SILT > <------PCT of SAND+SILT-------><---<2 mm--
><---PCT of 2mm---><----- <2mm -----><--------------->
            76  77  78  79  80  81  82  83  84  85  86  87  88  89   90    91
92    93    94    95    96    97    98    99   100

  4- 11     36  36  36  51  13   2  23  27  14  10   6   9  11   3        LCOS
77.3  19.8   2.9   4.6
  4- 11     34  34  34  51  15   2  22  22  14  11   8  12  12   4        LCOS
74.2  22.4   3.4   4.6




***   P R I M A R Y   C H A R A C T E R I Z A T I O N   D A T A   ***
S02NY-089-                              (ST LAWRENCE COUNTY, NEW YORK
)

PRINT DATE 06/05/02
SAMPLED AS    : COLTON               ;
REVISED TO    :                      ;

UNITED STATES DEPARTMENT OF AGRICULTURE
SSL - PROJECT  2P  17, (RP02NY057) FIELD TOUR
NATURAL RESOURCES CONSERVATION SERVICE
    - PEDON    2P  76, SAMPLES  2P  142-  142
NATIONAL SOIL SURVEY CENTER
    - GENERAL METHODS  1B1A, 2A1, 2B
SOIL SURVEY LABORATORY

LINCOLN, NEBRASKA 68508-3866
```

```
            -1--  -2--  -3--  -4--  -5--  -6--  -7--  -8--  -9--  -10-  -11-  -
12-  -13-  -14-  -15-  -16-  -17-  -18-  -19-  -20-

--------- ------------------------------------------------------------------
----------------------------------------------------
                             (- - -TOTAL - - -)(- -CLAY- -)(- -SILT- -)(- - - -
- -SAND- -  - - - -)(-COARSE FRACTIONS(MM)-)(>2MM)
                              CLAY  SILT  SAND  FINE   CO3  FINE COARSE  VF
F     M     C    VC   - - - - WEIGHT - - - -   WT
SAMPLE     DEPTH   HORIZON     LT   .002  .05    LT    LT   .002  .02   .05
.10   .25    .5     1    2    5     20     .1- PCT OF
  NO.      (CM)               .002  -.05   -2  .0002  .002  -.02  -.05  -.10  -
.25  -.50   -1     -2   -5   -20   -75    75  WHOLE
                              <- - - - - - - - - - - - - PCT OF <2MM  (3A1) - - -
- - - - - - - - - ->  <- PCT OF <75MM(3B1)->  SOIL

 2P 142S  10- 28   Bs          3.4  22.4  74.2              11.2  11.2   7.6
10.2  13.8  21.1  21.5  13    19    --      77  32

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----------------------------------------------------
            ORGN TOTAL  EXTR TOTAL (- - DITH-CIT - -)(RATIO/CLAY)(ATTERBERG )(-
BULK DENSITY -) COLE (- - -WATER CONTENT - -)  WRD
             C     N      P    S       EXTRACTABLE          15   - LIMITS -
FIELD  1/3  OVEN WHOLE FIELD  1/10   1/3   15  WHOLE
 DEPTH                                FE    AL    MN    CEC   BAR   LL    PI
MOIST  BAR  DRY   SOIL MOIST   BAR   BAR   BAR  SOIL
  (CM)      6A1c  6B4b  6S3e  6R3d  6C2h  6G7g  6D2g   8D1   8D1  4F1    4F
4A5   4A1d  4A1h  4D1   4B4   4B1c  4B1c  4B2a  4C1
            PCT   <2MM   PPM <- PERCENT  OF  <2MM -->            PCT <0.4MM
<- - G/CC - - -> CM/CM  <- - -PCT OF <2MM - -> CM/CM

 10- 28          0.129        0.04   0.3    TR    --  5.56  3.09
10.5
--------- ------------------------------------------------------------------
----------------------------------------------------
                              ***   P R I M A R Y   C H A R A C T E R I Z A T I
O N   D A T A   ***


S02NY-089-
PRINT DATE 06/05/02
SAMPLED AS    : COLTON                ;
USDA-NRCS-NSSC-SOIL SURVEY LABORATORY ; PEDON  2P  76, SAMPLE  2P  142-  142

            -1--  -2--  -3--  -4--  -5--  -6--  -7--  -8--  -9--  -10-  -11-  -
12-  -13-  -14-  -15-  -16-  -17-  -18-  -19-  -20-

--------- ------------------------------------------------------------------
----------------------------------------------------
           (- NH4OAC EXTRACTABLE BASES -) ACID- EXTR (- - - -CEC - - -)  AL   -
BASE SAT- CO3 AS RES.        COND.(- - - -PH - - -)
             CA    MG    NA     K   SUM    ITY   AL   SUM   NH4-  BASES  SAT
SUM   NH4  CACO3 OHMS        MMHOS NAF  CACL2  H2O
 DEPTH      5B5a  5B5a  5B5a  5B5a BASES              CATS   OAC  + AL
OAC  <2MM   /CM         /CM        .01M
  (CM)      6N2i  6O2h  6P2f  6Q2f        6H5a  6G9c  5A3a  5A8b  5A3b   5G1
5C3   5C1  6E1h  8E1         8I   8C1d  8C1f  8C1f
            <- - - - - - - - - - - - -MEQ / 100 G - - - - - - - - - - - ->  <- - -
- -PCT - - - ->                          1:2  1:1
```

```
 10- 28      0.9   0.2   0.2   0.2   1.5    --   0.6   1.5  18.9   2.1    29
100     8                        10.3   4.6   5.2

--------- -------------------------------------------------------------------
--------------------------------------------
```

ANALYSES: S= ALL ON SIEVED <2mm BASIS

*** P R I M A R Y   C H A R A C T E R I Z A T I O N   D A T A ***

S02NY-089-
PRINT DATE 06/05/02
SAMPLED AS    : COLTON                ;
USDA-NRCS-NSSC-SOIL SURVEY LABORATORY ; PEDON  2P  76, SAMPLE  2P  142-  142

```
            -1--  -2--  -3--  -4--  -5--  -6--  -7--  -8--  -9--  -10-  -11-  -
12-  -13-  -14-  -15-  -16-  -17-  -18-  -19-  -20-

--------- -------------------------------------------------------------------
--------------------------------------------
```

FRACTION INTERPRETATION:

MINERAL INTERPRETATION:

RELATIVE PEAK SIZE:   5 Very Large   4 Large   3 Medium   2 Small   1 Very Small   6 No Peaks

INTERPRETATION (BY HORIZON):

PEDON MINERALOGY
    BASED ON SAND/SILT:
    BASED ON CLAY:
    FAMILY MINERALOGY:
    COMMENTS:

*** P R I M A R Y   C H A R A C T E R I Z A T I O N   D A T A ***

S02NY-089-                              (ST LAWRENCE COUNTY, NEW YORK )

PRINT DATE 06/05/02
SAMPLED AS    : COLTON               ;

UNITED STATES DEPARTMENT OF AGRICULTURE
SSL - PROJECT  2P  17, (RP02NY057) FIELD TOUR
NATURAL RESOURCES CONSERVATION SERVICE
    - PEDON    2P  76, SAMPLES  2P  142-  142
NATIONAL SOIL SURVEY CENTER
    - GENERAL METHODS  1B1A, 2A1, 2B
SOIL SURVEY LABORATORY

LINCOLN, NEBRASKA 68508-3866

```
            -1--  -2--  -3--  -4--  -5--  -6--  -7--  -8--  -9--  -10-  -11-  -
12-  -13-  -14-  -15-  -16-  -17-  -18-  -19-  -20-

-----------------------------------------------------------------------------
--------------------------------------------
```

```
          ACID OXALATE EXTRACTION  PHOSPHOUS   KCL  TOTAL  (- -WATER  CONTENT-
- )(- - - - WATER DISPERSIBLE - - - - ) MIN   AGGRT
            OPT  FE    SI    AL          CIT-  MN     C    0.06   1-    2-
15  <- - PIPETTE - - >< - HYDROMETER - > SOIL  STABL
            DEN                      RET   ACID              BAR   BAR   BAR
BAR  CLAY  SILT  SAND  CLAY  SILT  SAND   CONT  <5mm
SAMPLE  HZ  8J1c  6C9b  6V2b 6G12b  6S4d  6S5   6D3b  6A2f  4B1c  4B1a  4B1a
4B2b <- - - 3A1c - - -><- - - SML  - - -> 8F1   4G1
  NO.   NO       <- P C T  o f < 2 m m -><- P P M  -><- - - - - - - - - - - P E
R C E N T   o f  < 2 m m - - - - - - - ><20mm>< PCT>

 2P 142  1  0.04  0.27  0.06  0.09    98         0.5  3.58

-----------------------------------------------------------------------------
---------------------------------------------------
                       ***  S U P P L E M E N T A R Y  C H A R A C T E R I Z
A T I O N  D A T A  ***
S02NY-089-                              (ST LAWRENCE COUNTY, NEW YORK
)

PRINT DATE 06/05/02
SAMPLED AS    : COLTON              ;
REVISED TO    :                     ;

UNITED STATES DEPARTMENT OF AGRICULTURE
SSL - PROJECT  2P  17, (RP02NY057) FIELD TOUR
NATURAL RESOURCES CONSERVATION SERVICE
    - PEDON    2P  76, SAMPLES  2P  142-  142
NATIONAL SOIL SURVEY CENTER
    - GENERAL METHODS  (ENGINEERING FRACTIONS ARE CALCULATED FROM USDA FRACTION
SIZES)      SOIL SURVEY LABORATORY

LINCOLN, NEBRASKA 68508-3866

-------- --------------------------------------------------------------------
---------------------------------------------------
                             E  N  G  I  N  E  E  R  I  N  G     P  S  D  A
CUMULATIVE CURVE FRACTIONS(<75mm)  ATTER- GRADATION
                           P E R C E N T A G E    P A S S I N G    S I E V E
USDA   LESS  THAN  DIAMETERS(mm) AT  BERG  UNI- CUR-
SAMPLE    DEPTH  HORIZON    3   2  3/2  1  3/4 3/8  4  10   40 200  20  5   2
1. .5  .25 .10 .05  60   50    10    LL PI FMTY VTUR
  No.    (In.)          <-----I N C H E S-----> <-N U M B E R-> <-MICRONS->
<--- MILLIMETER ---><--PERCENTILE--> <-PCT>  CU   CC
                             1   2   3   4   5   6   7   8   9  10  11  12  13
14  15  16  17  18  19    20    21    22 23   24   25

 2P 142S   4- 11   Bs      100 100 100 100 100  91  81  68  37  20  10   5   2
53  39  30  23  18 1.37 0.849 0.020       67.8  2.4
-------- --------------------------------------------------------------------
---------------------------------------------------
          (  W  E  I  G  H  T    F  R  A  C  T  I  O  N  S  )   ( W E I G H
T   P E R   U N I T  V O L U M E  G/CC )(  VOID  )
           ---W H O L E    S O I L (mm)-  -<75 mm FRACTION--      ------WHOLE
SOIL------  -------<2 mm FRACTION-------  --RATIOS--
 DEPTH      >2 250 250  75  75  20   5      75  75  20   5        SOIL SURVEY
ENGINEERING  --SOIL SURVEY-- ENGINEERING  AT 1/3  BAR
 (In.)        -UP -75  -2 -20  -5  -2  <2  -2 -20  -5  -2  <2      1/3  OVEN
MOIST SATUR  1/3   15   OVEN  MOIST SATUR  WHOLE  <2
           <------PCT of WHOLE SOIL-----> <--PCT OF <75 mm->      BAR  -DRY
-ATED  BAR   BAR  -DRY        -ATED  SOIL   mm
           26  27  28  29  30  31  32  33  34  35  36  37  38  39   40    41
42    43    44    45    46    47    48    49    50
```

```
  4- 11     32  --  --  32  --  19  13  68  32  --  19  13  68      1.70
--------- -----------------------------------------------------------------
----------------------------------------------------
                        ***  S U P P L E M E N T A R Y  C H A R A C T E R I Z
A T I O N  D A T A  ***


S02NY-089-
PRINT DATE 06/05/02
SAMPLED AS    : COLTON                 ;
USDA-NRCS-NSSC-SOIL SURVEY LABORATORY ; PEDON  2P  76, SAMPLE  2P  142-  142

-------- ------------------------------------------------------------------
----------------------------------------------------
           (  V  O  L  U  M  E     F  R  A  C  T  I  O  N  S  )(C/)(R A T I O S
to    C L A Y)( LINEAR EXTENSIBILITY )( W  R  D )
            ----W H O L E     S O I L (mm)   a t  1/3  B A R---(/N) --------<2
mm FRACTION-------  WHOLE SOIL  --<2 mm--  WHOLE  <2
 DEPTH      >2 250 250  75  75  20   5      2- .05- LT   PORES RAT  FINE  ---C
E C--   15   LEP   <-1/3 BAR to (PCT)--->  SOIL   mm
 (In.)         -UP -75  -2 -20  -5  -2  <2 .05 .002 .002 D   F -IO  CLAY   SUM
NH4-   BAR  1/3    15   OVEN   15   OVEN
            <---------------PCT of WHOLE SOIL---------------->            CATS
OAC   H2O  BAR    BAR  -DRY   BAR  -DRY  <--In/In->
            51  52  53  54  55  56  57  58  59  60  61  62  63  64   65    66
67    68    69    70    71    72    73    74    75

  4- 11     20  --  --  20  --  12   8  80  32  10   1  36                0.44
5.56  3.09
-------- ------------------------------------------------------------------
----------------------------------------------------
           (  W E I G H T   F R A C T I O N S - C L A Y   F R E E )(-TEXTURE--
)(--P S D A(mm)---)(PH )(-ELECTRICAL)<                >
           (--W H O L E  S O I L--) (--<2 mm  F R A C T I O N ----
)(DETERMINED)(SAND  SILT  CLAY) CA-  RES-  CON-  <               >
 DEPTH      >2  75  20  2- .05- LT  ------SANDS-------  SILTS   CL  IN    BY
2-   .05-   LT   CL2  IST.  DUCT. <               >
 (In.)         -2  -2 .05 .002.002 VC  C   M   F   VF  C   F   AY FIELD  PSDA
.05   .002  .002 .01M  OHMS  MMHOS <               >
            PCT of >2mm+SAND+SILT > <------PCT of SAND+SILT-------><---<2 mm--
><---PCT of 2mm---><----- <2mm ----->< --------------->
            76  77  78  79  80  81  82  83  84  85  86  87  88  89   90    91
92    93    94    95    96    97    98    99   100

  4- 11     33  33  33  52  16   2  22  22  14  11   8  12  12   4        LCOS
74.2  22.4   3.4   4.6
-------- ------------------------------------------------------------------
----------------------------------------------------
```

Leda Clay

```
-------- ------------------------------------------------------------------
----------------------------------------------------
                              ***  P R I M A R Y  C H A R A C T E R I Z A T I
O N  D A T A  ***
S02NY-089-                              (ST LAWRENCE COUNTY, NEW YORK
)
```

```
PRINT DATE 06/05/02
SAMPLED AS    : LEDA CLAY            ;
REVISED TO    :                      ;

UNITED STATES DEPARTMENT OF AGRICULTURE
SSL - PROJECT  2P  17, (RP02NY057) FIELD TOUR
NATURAL RESOURCES CONSERVATION SERVICE
    - PEDON    2P  75, SAMPLES  2P  140-  140
NATIONAL SOIL SURVEY CENTER
    - GENERAL METHODS  1B1A, 2A1, 2B
SOIL SURVEY LABORATORY

LINCOLN, NEBRASKA 68508-3866

            -1--  -2--  -3--  -4--  -5--  -6--  -7--  -8--  -9--  -10-  -11-  -
12-  -13-  -14-  -15-  -16-  -17-  -18-  -19-  -20-

--------- -----------------------------------------------------------------------
----------------------------------------------------
                              (- - -TOTAL - - -)(- -CLAY- -)(- -SILT- -)(- - - -
- -SAND- -  - - - -)(-COARSE FRACTIONS(MM)-)(>2MM)
                               CLAY  SILT  SAND  FINE   CO3  FINE COARSE  VF
F     M     C    VC   - - - - WEIGHT - - - -   WT
SAMPLE     DEPTH   HORIZON     LT   .002  .05    LT    LT   .002  .02   .05
.10   .25    .5     1    2    5     20     .1- PCT OF
  NO.      (CM)                .002  -.05   -2  .0002  .002  -.02  -.05  -.10  -
.25  -.50   -1     -2   -5   -20   -75    75  WHOLE
                               <- - - - - - - - - - - - - PCT OF <2MM  (3A2) - - -
- - - - - - - - - - ->  <- PCT OF <75MM(3B1)->  SOIL

 2P 140S   0-  0               12.2  57.1  30.7          --  19.6  37.5  29.7
0.9   0.1    TR    --  --    --    --      1  --

--------- -----------------------------------------------------------------------
----------------------------------------------------
            ORGN TOTAL  EXTR TOTAL (- - DITH-CIT - -)(RATIO/CLAY)(ATTERBERG )(-
BULK DENSITY -) COLE (- - -WATER CONTENT - -)  WRD
             C     N      P    S       EXTRACTABLE          15   - LIMITS -
FIELD  1/3  OVEN WHOLE FIELD  1/10   1/3   15  WHOLE
 DEPTH                                FE    AL    MN    CEC   BAR   LL    PI
MOIST  BAR  DRY   SOIL MOIST   BAR   BAR   BAR  SOIL
  (CM)      6A1d  6B4b  6S3f  6R3d  6C2i  6G7h  6D2h  8D1b  8D1b  4F1b   4F
4A5   4A1d  4A1h  4D1   4B4   4B1c  4B1c  4B2a  4C1b
            PCT   <2MM   PPM <- PERCENT  OF  <2MM -->             PCT <0.4MM
<- - G/CC - - -> CM/CM  <- - -PCT OF <2MM - -> CM/CM

  0-  0          0.009        0.10                   0.27  0.41
5.0
--------- -----------------------------------------------------------------------
----------------------------------------------------
                               ***   P R I M A R Y   C H A R A C T E R I Z A T I
O N   D A T A   ***


S02NY-089-
PRINT DATE 06/05/02
SAMPLED AS    : LEDA CLAY             ;
USDA-NRCS-NSSC-SOIL SURVEY LABORATORY ; PEDON  2P  75, SAMPLE  2P  140-  140

            -1--  -2--  -3--  -4--  -5--  -6--  -7--  -8--  -9--  -10-  -11-  -
12-  -13-  -14-  -15-  -16-  -17-  -18-  -19-  -20-
```

```
--------- -----------------------------------------------------------------
----------------------------------------------------
           (- NH4OAC EXTRACTABLE BASES -) ACID- EXTR (- - - -CEC - - -)  AL   -
BASE SAT- CO3 AS RES.        COND.(- - - -PH - - -)
             CA    MG    NA     K   SUM    ITY   AL   SUM   NH4-  BASES  SAT
SUM   NH4  CACO3 OHMS        MMHOS      CACL2  H2O
 DEPTH      5B5c  5B5c  5B5c  5B5c BASES              CATS   OAC  + AL
OAC  <2MM   /CM         /CM        .01M
  (CM)      6N2j  6O2i  6P2g  6Q2g        6H5b  6G9e  5A3c  5A8e  5A3d  5G1b
5C3b  5C1b  6E1h  8E1          8I         8C1j  8C1j
            <- - - - - - - - - - - - -MEQ / 100 G - - - - - - - - - - - ->  <- - -
- -PCT - - - ->                           1:2  1:1

  0-  0            2.2   0.2   0.2                         3.3
100   100    22                           7.3   7.2

--------- -----------------------------------------------------------------
----------------------------------------------------

        ANALYSES:  S= ALL ON SIEVED <2mm BASIS
                              ***   P R I M A R Y   C H A R A C T E R I Z A T I
O N   D A T A   ***


S02NY-089-
PRINT DATE 06/05/02
SAMPLED AS    : LEDA CLAY             ;
USDA-NRCS-NSSC-SOIL SURVEY LABORATORY ; PEDON  2P  75, SAMPLE  2P  140-  140

            -1--  -2--  -3--  -4--  -5--  -6--  -7--  -8--  -9--  -10-  -11-  -
12-  -13-  -14-  -15-  -16-  -17-  -18-  -19-  -20-

--------- -----------------------------------------------------------------
----------------------------------------------------
           < - - - - - - - - - - - - - - - - - - - - - - - -  CLAY MINERALOGY
(<.002mm) - - - - - - - - - - - - - - - - - - - - - - - - - >
           FRACT < - - - - - - X-RAY - - - - - -><  - - - THERMAL - - - -><  - - -
- - - - ELEMENTAL - - - - - - - - -><  - -> EGME  INTER
SAMPLE       ION <                           >< - DTA - -><  - TGA - -> SiO2
AL2O3 Fe2O3  MgO   CaO   K2O   Na2O <    > RETN  PRETA
                 < - - - - - -  7A2i - - - - - -><  - 7A6b - ><  - 7A4c - ><  - - -
- - - - - - - 7C4a- - - - - - - - -><    >  7D2   TION
NUMBER     <- - ><  - - - - peak size - - - - -><  - - - Percent - - - -><  - - -
- - - - - - Percent - - - - - - - - -><  - -><mg/g><  - ->

 2P 140     TCLY  MI 3  KK 2  CL 1  HB 1  QZ 1
 2P 140     TCLY  CR 1

--------- -----------------------------------------------------------------
----------------------------------------------------

FRACTION INTERPRETATION:

    TCLY  Total Clay, <0.002mm

MINERAL INTERPRETATION:

    MI  mica             KK  kaolinite        CL  chlorite         HB
hydrobiotite     QZ  quartz           CR  cristobalite


RELATIVE PEAK SIZE:   5 Very Large   4 Large   3 Medium   2 Small   1 Very
Small   6 No Peaks
```

INTERPRETATION (BY HORIZON):

PEDON MINERALOGY
BASED ON SAND/SILT:
BASED ON CLAY:
FAMILY MINERALOGY:
COMMENTS:

*** P R I M A R Y C H A R A C T E R I Z A T I O N D A T A ***

S02NY-089- (ST LAWRENCE COUNTY, NEW YORK )

PRINT DATE 06/05/02
SAMPLED AS : LEDA CLAY ;

UNITED STATES DEPARTMENT OF AGRICULTURE
SSL - PROJECT 2P 17, (RP02NY057) FIELD TOUR
NATURAL RESOURCES CONSERVATION SERVICE
- PEDON 2P 75, SAMPLES 2P 140- 140
NATIONAL SOIL SURVEY CENTER
- GENERAL METHODS 1B1A, 2A1, 2B
SOIL SURVEY LABORATORY

LINCOLN, NEBRASKA 68508-3866

```
            -1--  -2--  -3--  -4--  -5--  -6--  -7--  -8--  -9--  -10-  -11-  -
12-  -13-  -14-  -15-  -16-  -17-  -18-  -19-  -20-

-------------------------------------------------------------------------------
--------------------------------------------------
           ACID OXALATE EXTRACTION  PHOSPHOUS   KCL  TOTAL  (- -WATER  CONTENT-
- )(- - - - WATER DISPERSIBLE - - - - ) MIN   AGGRT
             OPT  FE    SI    AL         CIT-  MN     C    0.06   1-    2-
15  <- - PIPETTE - - >< - HYDROMETER - > SOIL  STABL
             DEN                    RET   ACID                BAR   BAR   BAR
BAR  CLAY  SILT  SAND  CLAY  SILT  SAND   CONT  <5mm
SAMPLE  HZ  8J1d  6C9c  6V2c 6G12b  6S4e  6S5   6D3d  6A2f  4B1c  4B1f  4B1f
4B2b <- - - 3A2c - - -><- - - SML  - - -> 8F1   4G1b
  NO.   NO       <- P C T  o f < 2 m m -><- P P M  ->< - - - - - - - - - - P E
R C E N T  o f  < 2 m m - - - - - - - - ><20mm>< PCT>

 2P 140  1                                            2.86

-------------------------------------------------------------------------------
--------------------------------------------------
```

*** S U P P L E M E N T A R Y C H A R A C T E R I Z A T I O N D A T A ***

S02NY-089- (ST LAWRENCE COUNTY, NEW YORK )

PRINT DATE 06/05/02
SAMPLED AS : LEDA CLAY ;
REVISED TO : ;

UNITED STATES DEPARTMENT OF AGRICULTURE
SSL - PROJECT 2P 17, (RP02NY057) FIELD TOUR
NATURAL RESOURCES CONSERVATION SERVICE
- PEDON 2P 75, SAMPLES 2P 140- 140
NATIONAL SOIL SURVEY CENTER
- GENERAL METHODS (ENGINEERING FRACTIONS ARE CALCULATED FROM USDA FRACTION SIZES) SOIL SURVEY LABORATORY

```
LINCOLN, NEBRASKA 68508-3866

-------- -----------------------------------------------------------------------
-----------------------------------------------
                          E  N  G  I  N  E  E  R  I  N  G     P  S  D  A
CUMULATIVE CURVE FRACTIONS(<75mm)  ATTER- GRADATION
                        P E R C E N T A G E    P A S S I N G    S I E V E
USDA   LESS  THAN  DIAMETERS(mm) AT  BERG  UNI- CUR-
SAMPLE    DEPTH  HORIZON    3   2  3/2  1  3/4 3/8  4  10   40 200  20  5   2
1. .5  .25 .10 .05  60   50    10    LL PI FMTY VTUR
  No.     (In.)           <-----I N C H E S-----> <-N U M B E R-> <-MICRONS->
<--- MILLIMETER ---><--PERCENTILE--> <-PCT>  CU   CC
                          1   2   3   4   5   6   7   8   9  10  11  12  13
14  15  16  17  18  19    20    21   22 23   24   25

 2P 140S   0-  0          100 100 100 100 100 100 100 100 100  89  32  20  12
100 100 100  99  69 0.04 0.031 0.001        30.2  5.0
-------- -----------------------------------------------------------------------
-----------------------------------------------
          (  W  E  I  G  H  T    F  R  A  C  T  I  O  N  S  )   ( W E I G H
T  P E R   U N I T  V O L U M E  G/CC )(  VOID  )
           ---W H O L E    S O I L (mm)-  -<75 mm FRACTION--      ------WHOLE
SOIL------  -------<2 mm FRACTION-------  --RATIOS--
 DEPTH      >2 250 250  75  75  20   5      75  75  20   5         SOIL SURVEY
ENGINEERING  --SOIL SURVEY-- ENGINEERING  AT 1/3  BAR
 (In.)         -UP -75  -2 -20  -5  -2  <2  -2 -20  -5  -2  <2      1/3  OVEN
MOIST SATUR  1/3   15   OVEN  MOIST SATUR  WHOLE  <2
           <------PCT of WHOLE SOIL-----> <--PCT OF <75 mm->      BAR  -DRY
-ATED  BAR   BAR  -DRY        -ATED  SOIL   mm
           26  27  28  29  30  31  32  33  34  35  36  37  38  39   40    41
42    43    44    45    46    47    48    49    50

  0-  0     --  --  --  --  --  --  -- 100  --  --  --  -- 100      1.45
--------- ----------------------------------------------------------------------
-----------------------------------------------
                     ***  S U P P L E M E N T A R Y  C H A R A C T E R I Z
A T I O N  D A T A  ***


S02NY-089-
PRINT DATE 06/05/02
SAMPLED AS    : LEDA CLAY             ;
USDA-NRCS-NSSC-SOIL SURVEY LABORATORY ; PEDON  2P  75, SAMPLE  2P  140-  140

-------- -----------------------------------------------------------------------
-----------------------------------------------
          (  V  O  L  U  M  E    F  R  A  C  T  I  O  N  S  )(C/)(R A T I O S
to    C L A Y)( LINEAR EXTENSIBILITY )( W  R  D )
           ----W H O L E    S O I L (mm)   a t  1/3  B A R---(/N) --------<2
mm FRACTION-------  WHOLE SOIL  --<2 mm--  WHOLE  <2
 DEPTH      >2 250 250  75  75  20   5      2- .05- LT   PORES RAT  FINE  ---C
E C--   15   LEP   <-1/3 BAR to (PCT)--->  SOIL   mm
 (In.)         -UP -75  -2 -20  -5  -2  <2 .05 .002 .002 D   F -IO  CLAY   SUM
NH4-   BAR  1/3    15   OVEN   15   OVEN
           <---------------PCT of WHOLE SOIL---------------->           CATS
OAC   H2O  BAR    BAR  -DRY   BAR  -DRY  <--In/In->
           51  52  53  54  55  56  57  58  59  60  61  62  63  64   65    66
67    68    69    70    71    72    73    74    75

  0-  0     --  --  --  --  --  --  -- 100  17  31   7  45               3.83
0.27  0.41
```

```
-------- ------------------------------------------------------------------
-----------------------------------------------------
           (  W E I G H T   F R A C T I O N S - C L A Y   F R E E )(-TEXTURE--
)(--P S D A(mm)---)(PH )(-ELECTRICAL)<               >
           (--W H O L E  S O I L--) (--<2 mm  F R A C T I O N ----
)(DETERMINED)(SAND  SILT  CLAY) CA-  RES-  CON-  <               >
 DEPTH      >2  75  20  2- .05- LT  ------SANDS-------  SILTS   CL  IN    BY
2-   .05-   LT   CL2  IST.  DUCT. <               >
 (In.)          -2  -2 .05 .002.002 VC  C   M   F   VF  C   F   AY FIELD  PSDA
.05   .002  .002 .01M  OHMS  MMHOS <               >
            PCT of >2mm+SAND+SILT > <------PCT of SAND+SILT-------><---<2 mm--
><---PCT of 2mm---><----- <2mm -----><--------------->
            76  77  78  79  80  81  82  83  84  85  86  87  88  89   90    91
92    93    94    95    96    97    98    99   100

  0-  0                 35  65  14          TR   1  34  43  22  14        SIL
30.7  57.1  12.2   7.3
-------- ------------------------------------------------------------------
-----------------------------------------------------
```

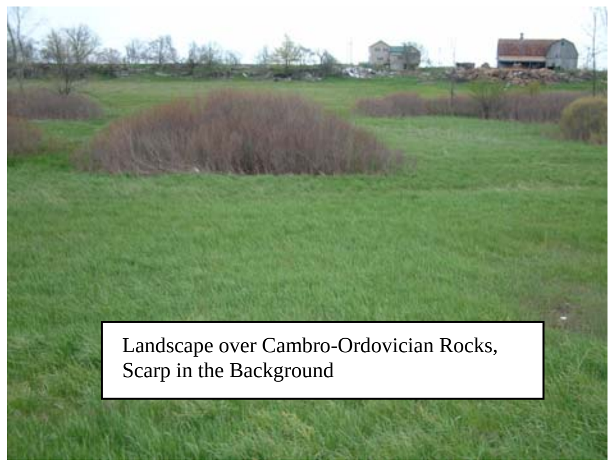
Leda Clay

## Appendix 6, Photographs

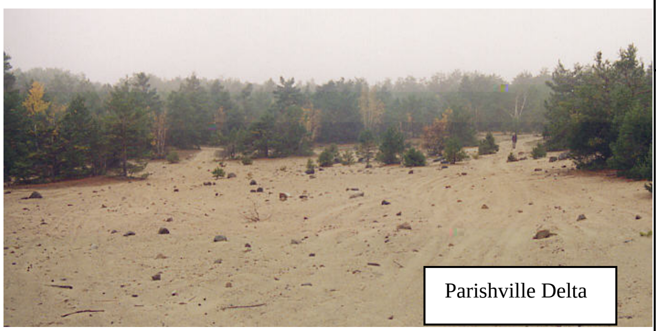
Roches Moutainee

Potsdam Sandstone

Shallow Soils Over Theresa Dolomite



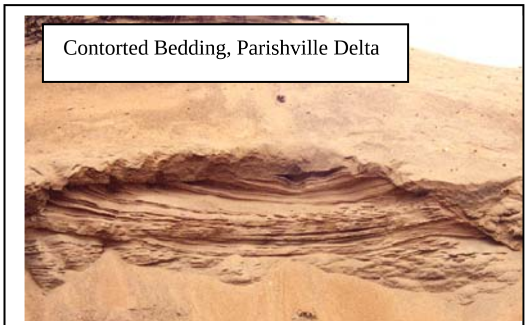
Landscape over Cambro-Ordovician Rocks, Scarp in the Background



Parishville Delta

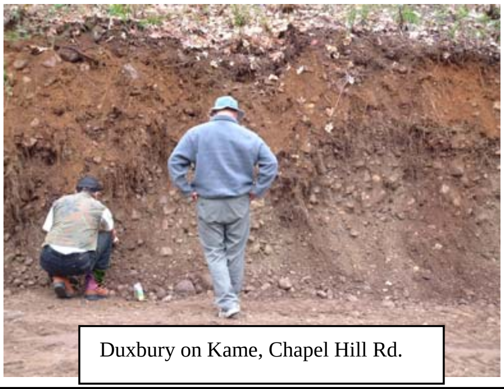
Desert Pavement, Parishville Delta

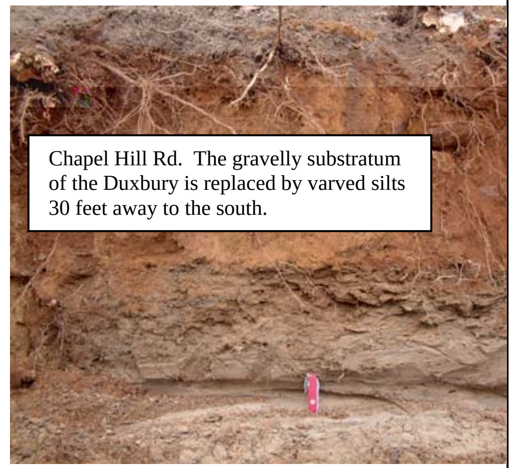
Ventifact, Parishville Delta



Contorted Bedding, Parishville Delta

# Appendix 7, Photographs

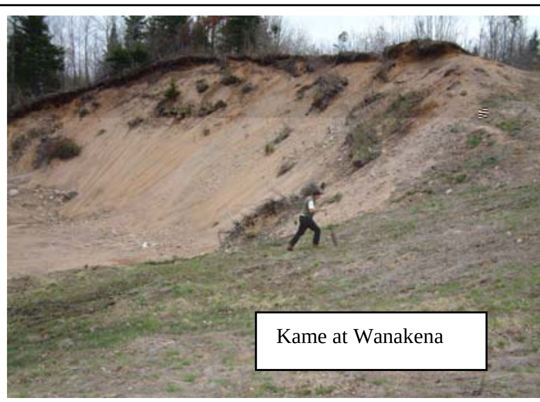

Duxbury on Kame, Chapel Hill Rd.


Chapel Hill Rd. The gravelly substratum of the Duxbury is replaced by varved silts 30 feet away to the south.

Colton at Massawepie


Transverse Section of Massawepie Esker

Adams at Wanakena


Kame at Wanakena

## National Office Report

Northeast Work Planning Conference
June 24-28, 2002
Comments
Maurice J. Mausbach

It's good to be here with the Northeast Work Planning Conference. It has been awhile - I think the last time we stayed in dorm rooms in Vermont! There are a lot of things happening in the agency now since we have a new Farm Bill. Today, I would like to visit a bit on:

- Personnel Recent Personnel Changes
- 2002 Farm Bill
- Soil Survey issues including budgets
- Future of soil survey

**RECENT PERSONNEL CHANGES**

Much has changed over the last 6 months: We have a new Division Director - Dr. Berman Hudson. I know most of you know him and know that he will carry on the good work of Horace Smith. He wanted me to bring you greetings and to express regrets that he is unable to attend. He is at another conference this week. The agency also has a new Chief, Bruce I. Knight, who was previously with the Corn Growers. He is a native of South Dakota and owns a farm/ranch in the state. He is very well acquainted with the Soil Survey. In fact he told me that he had almost worn out the copy of the survey for his county. Needless to say he is very supportive of the soil survey and wants to aggressively pursue completing the digitizing project. He also understands the need to continuously update the soil survey and thus will support continued funding to support the update process. We also have changes in personnel at the Soil Survey Center – I’ll leave that Maxine will cover.

**FARM BILL**

The Farm Security and Rural Investment Act of 2002, or more simply the 2002 Farm Bill represents the single most significant commitment of resources toward conservation on private lands in the Nation's history. It applies to all natural resources, including soil, water, air, and wildlife. It mentions improvement of soil quality - a first in national legislation. The Farm Bill:

- Significantly increases funding for EQIP and ensures greater access by making more farmers and ranchers eligible through program streamlining.
- Creates a new Conservation Security Program to reward producers who have practice good stewardship and incentives to those who want to do more.
- Reauthorizes theWildlife Habitat Incentives Program
- Reauthorizes the Farmland Protection Program to help protect the Nation's best farmland from conversion to non-agricultural uses.

- Provides permanent reauthorization of the RC&D program

Our (NRCS) goals for implementing the Farm Bill are timely and effective delivery of conservation programs by:

- Enhancing administrative efficiencies
- Ensuring technical and program delivery capacity, and
- Emphasizing communication and public notification.

With respect to technical and program delivery, we will:

- Accelerate deployment of the Customer Service Tool Kit
- Make significant additional investment in digitized soil surveys and other technical information needed by the tool kit
- Ensure electronic access to agency technical guides

The farm bill funding for conservation programs is a follows:

- EQIP goes from 400 million in FY02 to 1.3 billion in 2007. And this is mandatory funding! There are a lot of items in the new farm bill, but I do want to highlight the innovative grants part of EQIP. Beginning in 2003 there is a provision for up to $100 M for innovative grants to address such things as global climate change. These grants are on a 50-50 cost share basis. Among other things, I can see groups proposing carbon sequestration projects - to test the feasibility of trading carbon as a commodity.

With the significant increases in funding comes an increased need to monitor impacts of the programs and funding. We are working to develop a plan using the National Resources Inventory and other data sources to monitor trends in environmental indicators much as we have done for land use, soil erosion, and wetlands in the past. By the way, we have transitioned to an annual NRI data collection and are in the third year of annual data collection.

Needless to say, much of our focus of late is to implement the new provisions of the farm bill. There will be more work that we can possibly do, so the farm bill has a third party vendor provision. We are still working on the details, but I can tell you third party vendors will want electronic access to our soil survey data. It is imperative that we get our surveys digitized and make them available as soon as possible. In addition to the digital data, we are also working to get our field office technical guides electronically available. Section 2 of the FOTG contains our soil survey interpretative data. I know many of you are working to make sure the information is current as it goes into our eFOTG!

**SOIL SURVEY ISSUES/BUDGETS**

- **Geospatial Data Warehouse/gateway -**We are working on a geospatial data warehouse to store and data gateway to serve the data to the public. If you have not visited the site, we have developed an award winning geospatial data gateway at http://www.lighthouse.nrcs.usda.gov/lighthouse/. I encourage all of you to visit the site. This is currently a prototype and we are now going after increased funding to finish the project. The many users of the soil survey data do not want or need GIS software on their systems if they can perform the GIS functions on line. The data gateway helps to serve that purpose.

- **Publications** - Finishing the paper work seems to be a problem! In addition to running a backlog on getting publications out in a timely manner, we seem to drop the ball at the State level in getting all of the materials (Manuscripts and Maps) ready for publication. One of the problems with the printing backlog is that we have not had enough money to print all of the surveys that are ready in a year. This year we increased the amount to $1.5 M but we need to double that to stay ahead. We need to look forward and try to move away from the hardcopy publications. To start in this direction, we need your help when developing new MOU's that we work towards electronic publications (CDs). We will still print a limited number of copies but it is much easier and much less costly going with CDs. You may want to refer a report entitled "Soil Survey CD Summit" which was distributed to all states.
- **Staff/Succession -** The NCSS is charged with keeping soil maps current on 2.3 billion acres. In addition to the map information, we are charged with maintaining the soils database that is required to interpret the maps. This includes data and interpretive information on more than 22,000 different soils. In order to do this effectively using current technology, NRCS and its partners must maintain a permanent field staff of 1000-1100 soil scientists nationwide. With an estimated 50% of the current soil survey staff eligible to retire within the next 5 years, replacing and retraining our national workforce is a critical issue. We need all of the cooperators help especially our University partners to actively recruit students into soil science. I encourage our state soil scientists to work with their university partners to address these workforce issues.
- **2003 Budget** - the President's budget for FY 2003 has an increase of almost $9M for soil survey, however this will mostly cover cost of living increases. The good news is, however, with the Farm Bill the agency's budget should improve next year - hopefully more money will be available for operations and technology development.
- **2004 Budget** - We are now in the beginning stages of developing our 2004 budget. I know there is much interest for us to speed up the digitizing of soil survey with a 2005-2006 timeline for completion. To reach that we will need additional funding. We are also looking for funding to complete mapping on Native American lands, for publications, the datagateway/warehouse, and to update equipment at the NSSC. At this point, we can only speculate on what will be forwarded for consideration.
- **GIS Center of Excellence** - There is some interested on the Hill for establishing a GIS Center of Excellence in the agency. In our 2002 appropriations, we were asked to develop a plan for such a center to be housed at West Virginia University. We have developed the plan and now are waiting for the outcome of the 2003 appropriation process which has just

begun. I must say that I am extremely hopeful that the center will be funded at some level. We have this rich data resource - a national treasure in the soil survey (SSURGO and STATSGO), but we have only begun to tap its hidden treasures.

- **2002 awards –** Each year we give out two awards in soil survey – the Soil Scientist Achievement Award and the Soil Scientist of the Year Award. David Roberts, Area Resource Soil Scientist, Madison Wisconsin is the Soil Scientist of the Year and received the award this week at the North Central Work Planning Conference. Allen G. Giencke, Soil Data Quality Specialist, St. Paul MN is the recipient of the Soil Scientist Achievement Award. That award will be presented at the Soil Science Society of America conference in Indianapolis, IN this November.

**THE FUTURE**

I can't help but say a few words on my perspective on the future of Soil Survey. I think we are in a very strong position in soil survey. We are well along on digitizing our surveys, we have an active update program, and we are well on our way to using the latest technology in serving our data to our customers. We have a strong customer base built by producing a product that people can use and supported with a national policy and a strong marketing program. We have accomplished a lot together and we can continue to accomplish a lot by fostering cooperative program.

We are now into the electronic or E-Soil Survey phase, the others being the plane table, aerial photography, and soil taxonomy. The future of soil survey rests in our ability to make the best use of the available electronic tools whether it be GIS, the internet, or remote sensing/image processing. To this end, we have some exciting research in the use of knowledge capture coupled with GIS tools to capture the landscape model used to conduct the survey, generating maps using the model, refining the model, and ending with a complete electronic package of the survey. This electronic package captures the landscape model, something that vanished with the project leader, and using it in the interpretation phase. I am pleased that some of our collaborators are adding faculty to address this area of soil survey. We must continue to research methods for making our field soil scientists as efficient as possible while increasing the quality of the product.

Again, I believe the future is good for the second century of soil survey. Thanks again for the opportunity to speak to you.

## MLRA Office Reports

### STATUS FOR MO-12 NORTHEAST REGION

The staff is composed of the Team Leader - Bruce W. Thompson;
4 Data Soil Data Quality Specialists - Andrew Williams, correlation; Steve Fischer, correlation; Shawn Finn, databases and correlation, and Darlene Monds, SSURGO, STATSGO, and GIS products. Kristie Wiley is the Writer/Editor.

John Kick is the ICCS with NRI quality assurance responsibility for New England and New York and he is assigned to the MO-12 staff.

Steve Fischer currently is responsible for all production soil survey activities in NY, OH, and PA which represents approximately 72 counties, areas, or Indian Reservations. He is conducting the following activities:

| | |
|---|---|
| Progress field reviews | 8 |
| Initial field reviews | 2 |
| Final field review | 1 |
| Technical reviews by the state | 3 |
| Technical edit (10%) by the MO | 3 |
| Awaiting English edit - not at MO | 5 |
| Awaiting English edit - at the MO | 3 |

Shawn Finn currently is responsibly for all production soil survey activities in NJ, CT, and RI and parts of MA which represents approximately 28 counties or areas. In addition Shawn is responsible for the quality assurance for all database activities for the MO. The State of Connecticut has completed the mapping phase of the state update and is working with Massachusetts to agree on an acceptable, if not exact,
joins along the state boundary.
Shawn is conducting the following activities:

| | |
|---|---|
| Progress field reviews | 1 |
| Initial field reviews | 3 |
| Final field reviews | 3 |
| Correlation doc. preparation | 3 |

Andrew Williams currently is responsible for all production soil survey activities in ME, VT, and NH and parts of Massachusetts which represents approximately 53 counties or areas. Andrew attended the USDA Graduate School for the past two years and completed his MS degree this past May while still performing his duties as SDQS. He is conducting the following activities:

| | |
|---|---|
| Progress field reviews | 4 |
| Initial field reviews | 2 |
| Final correlation conference | 2 |
| Correlation doc preparation | 2 |
| Correlation doc redraft | 1 |
| Technical review (10%) by MO | 4 |

Darlene Monds is responsible for all activities related to quality assurance associated with map compilation, map finishing and check plot review (SSURGO), STATSGO, and providing training to field personnel for all of these specialties.

| | |
|---|---|
| Map compilation reviews - completed | 6 |
| Map compilation reviews - pending | 3 |
| Digitizing reviews - completed | 2 |

| | |
|---|---|
| Map finishing reviews - completed | 4 |
| Digitizing (check plot)reviews | 6 |

Recertification

Joining for SSURGO certification data

All previous certified data needs to be checked for a "shared" boundary and an "acceptable" join with surrounding surveys that are also certified or compiled.

Kristie Wiley is responsible for all activities related to soil survey publications. This includes the English edit, typesetting, ordering the General Soils Map and review of the text, review of block diagrams, pictures and setting a schedule for the timely completion of the text and maps so both products arrive at Cartographic at the same time.

Manuscript Status

At GPO for printing
- Union County, NJ
- Dutchess County, NY

Typeset complete
- Franklin County Area and Part of Somerset County, ME

English edit in progress
- Saratoga County, NY

Received for English edit
- St. Lawrence County, NY
- Clinton County, NY

St. Regis County, NY
Washington County, VT
Piscataquis County, ME

John Kick is responsible for NRI activities for the six New England states and New York State. He is the ICCS with quality assurance responsibilities for the seven state area. Generally specking NRI activities were completed on time for most of the states. All errors have been reviewed and corrections made to the database. The Northeast NRI uses Digital Ortho Quads as their base and John is actively working toward the capability of being able to rectify the material provided by the vendors that conduct the flying of the PSU points.

The MO is acting as host for several functions this year.

National Envirothon

The National Envirothon will be held the week of July 29 to August 3, 2002 on the campus of Hampshire College in Amherst, Massachusetts. Approximately 48 teams from the United States and Canada will participate.

Northeast Forest / Soils Conference

The NE Forest / Soils Conference will be held the week of August 25 to 27, 2002 in Amherst, MA. The field visits will start with a trip to Harvard Forest in Petersham, MA to hear about research related to forest ecology. Harvard Forest was the site of the first meeting of the NE Forest / Soils Conference in 1948. The second day will be spent at the Quabbin Reservoir looking at paired watersheds with differing harvesting techniques and whole tree harvesting equipment and potential compaction problems associated with this method of harvesting forest products.

The correlation and MLRA concept course was held in Amherst, MA at the Regional Fishand Wildlife Office in Hadley, MA. We volunteered to host this training course to reduce costs for personnel in the NE who wished to attend.

One of the Soil Survey Divisions top priorities is the update of Agricultural Handbook 296 - Land Resource Regions and Major Land Resource Areas of the United States and the STATSGO Map. We are working on the following aspect of this project:

All Official Series Descriptions (OSD) used in STATSGO have been reviewed and the Classifications have been updated to reflect the 2nd edition of Soil Taxonomy.

All MLRA boundaries have been reviewed with the State Soil Scientists and boundary adjustments have been updated and entered into the National Database maintained by Sharon Waltman at the NSSC. The adjustments were entered into the system by Darlene Monds using the Martha Tool software. The write- ups are being prepared in Lincoln, NE for each MLRA and will be available for review in the near future.

STATSGO units are being reviewed by the states for possible update and refinement since the majority of the initial mapping is complete. Some states have completely reworked their maps while other states have made little or no changes in their databases. The MO is responsible for maintaining a seamless join between the states and between the MOs. The MO has been working with the states on the joins and we expect the states to conduct meetings to assure the joins are perfect before we finalize this project next winter season.

While we were updating the series used for STATSGO purposes, we reviewed all the series that are our responsibility and adjusted the classifications. They all agree with the 2nd edition to Soil Taxonomy and the updates were entered into the Classification File. The OSD's are being updated as we correlate active soil surveys and this procedure should result in the majority of the series being modernized.

Bruce W. Thompson
MO-12 Team Leader

**Manuscript Status**

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**Key Issues**

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**Mid-Atlantic Region 14**
**Raleigh, North Carolina**

**Report to the Northeast Cooperative Soil Survey Conference**
**Alexandria Bay, New York, June 24-28, 2002**

*Primary activities, staffing, & goals:*
MLRA Region 14 development (NASIS), maintenance and development of Official Soil Seri oversees 73 Active Project Soil Surveys including the coordination of databases Descriptions and the Soil Classification File, SSURGO Soil Business, and serves as a NRI-Inventory Collection and Coordination site for Virginia, North Carolina, South Carolina, and Georgia.

*Primary Soil Data Quality Specialists responsibilities and workload:*
Debbie Anderson--13 survey areas (SC, NC); 7 surveys with mapping underway, 1 survey needing correlation, and coordinates Map Development.

Richard Brooks--15 survey areas (AL, SC, GA); 7 surveys with mapping underway, 3 surveys needing correlation, and coordinates Database Development (NASIS).

Marc Crouch--21 survey areas (FL, SC, NC, VA, MD); 9 surveys with mapping underway, 5 surveys needing correlation, and serves as MO Training Coordinator.

John Kelley--18 survey areas (NC, MD, DE, NJ); 10 surveys with mapping underway, 3 surveys needing correlation, and coordinates Manuscripts Development.

Phil Tant--6 survey areas (NC, VA); 2 surveys with mapping underway, 3 surveys needing correlation, and serves as NRI-ICCS Leader.

The remaining staff consists of Rosetta Curtis, Secretary, Jennifer Sutherland, Editor, Dora Richardson, Public Affairs Specialist, and Plummer Vines, Cartographic Technician.

The results of a questionnaire sent to Region 14 personnel and cooperators and presented to Board of Directors was discussed.  Suggestions and results have been used in the development of the MO Long-range Plan with periodic follow-up by MLRA Office staff to address the recommendations and concerns.

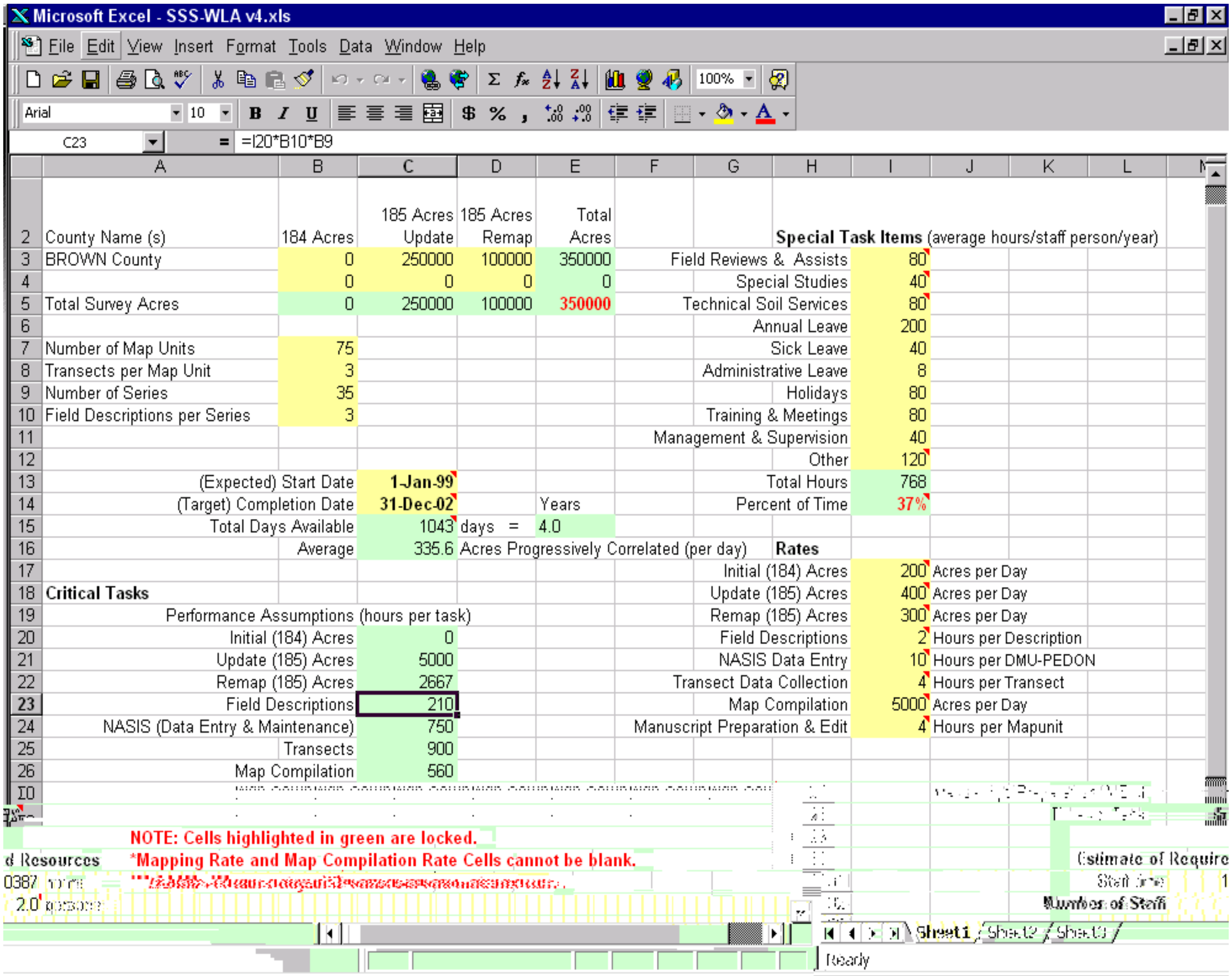
*Key Issues Addressed:*
1.  Ensuring uniformity of mapping concepts by conducting mapping inspections, supporting a “team” concept of correlation, requiring the use of standardized guides, encouraging Soil Data Quality Specialists to participate in other team meetings and field reviews, and posting minutes and/or decisions of team meetings on the MO home page.

2. Providing customer service by responding in a timely manner to requests (unless in travel status), use of voicemail while in travel, field team approach to correlation, and utilizing the MO email list server for communication of ideas.

3. Support training of soil scientists by continuing MO facilitated technical workshops, addressing topics submitted from the field, and utilizing alternate methods for training such as written exercises, PowerPoints, Net meeting, etc.

*What products and services are helpful?*
Continued use of quality control checklists, working with project staff ahead of time to ensure that the staff is ready for field reviews before MO SDQS arrive, development of technical notes, and continued develop of improved methods for transfer of technology. Examples of present methods include recently updated MO14 correlation “Quick Key” and posting helpful hints and correlation team decisions on MO home page (Inside MO14).

*How can we (MOs) improve to meet field soil scientists needs?*
**Suggestions include:**
**--coordination of regional soil sampling studies,**
**--development of standards for NASIS population,**
**--development of guides for MO-wide use,**
**--implementing the philosophy of building data as we correlate using OSD data mapunits, OSD pedons (especially new series) and sharing of established data (survey area data mapunits, pedons, transect data, etc.),**
**--utilizing automated reports such as the map unit generator (MUG), taxonomic unit generator (TUD), and electronic versions of prewritten materials (using “tracking changes” tool), and**
**--assistance with the development of a workload analysis procedure as in the following example.**




*How can we (MOs) improve to meet the needs of the NCSS Partnership?*
Suggestions include:
--continued improvement in communication (two-way street),
--newsletters, MO, SO, Univ., Consultant's, etc.,
--updates on the status of soil survey manuscript completion and status;
--timely Soil Survey Schedule data entry and use as a management tool,
--improvement of methods for revisions/creation of OSDs, and
--use of group email lists (mo14_all) to facilitate discussion and awareness of technical issues.

# NRCS State Reports

## Maine

**REPORT ON MAINE'S SOIL SURVEY PROGRAM**
**WAYNE HOAR, STATE SOIL SCIENTIST**
**NORTHEAST COOPERATIVE SOIL SURVEY CONFERENCE**
**ALEXANDRIA BAY, NY JUNE 24-28, 2002**

There is currently soil survey information available for 80 percent of the nearly 20 million acres of land in the State of Maine. The soil survey of Penobscot County (over 2 million acres), is out of print and out of date. We currently have two soil survey projects on going, one is an update of the southern portion of Penobscot County and the other is an initial survey of Northern Hancock & Western Washington Counties. We have hired three entry-level Soil Scientists in the last two years, and have lost two experienced Project Leaders to retirement over this same period. We have completed two initial surveys in the last two years.

There are twenty soil survey areas in Maine, 16 have mapping complete (one of these is outdated), 12 of these are published, and 2 are in the final stages of being published. Nine areas have digital soil data, one is currently being digitized and one is being compiled for digitizing.

We currently have a staff of 2 Project Leaders, 5 Field Soil Scientists, 2 Soil Resource Specialists and 1 Soil Database Manager/GIS Specialist. The survey in Washington-Hancock Counties includes the Narraguagus and Pleasant River Watersheds, which are part of an Atlantic Salmon Habitat restoration and enhancement project. The update survey of Southern Penobscot County, which will have its Initial Field Review this year, has a large area of farmland (dairy and cropland) that is facing pressure for urban development as the City of Bangor spreads out into the surrounding rural areas.

The 2 Soil Resource Specialists provide onsite assistance for NRCS programs including wetland delineation's, as well as soils education and outreach efforts, primarily through Envirothons, Maine Farm Days and other programs. They have also been active with the University of Southern Maine in describing and sampling urban soils in the City of Portland, with an emphasis on heavy metal testing.

Special field studies that we have on going include: conducting one water table study to determine the relationship of soil temperature and seasonal water table depths to the location of redoximorphic features in two proposed series; continuing to gather soil temperature data at 6 sites to accurately delineate the cryic/frigid boundary and also to determine the temperature regime for the coastal islands; continuing to assess the extent of Humods along the coast and in the mountainous areas of Western Maine; and collecting forest site index data to improve our forest soils productivity ratings.

New Hampshire

**Northeast Cooperative Soil Survey Conference**
**Alexandria Bay, NY**

**New Hampshire Soil Survey Report**

## Cooperative Soil Survey Program

There is currently one on-going Soil Survey in progress, the Merrimack-Belknap Soil Survey Update. The quality and concepts of the previous mapping is such that the mapping style is a remap, rather than a traditional update. Over 90 percent of the survey area has been remapped. The final field review is tentatively scheduled for 2003.

Mapping and final correlation has been completed for the Coos County Soil Survey, which finalizes the initial mapping of New Hampshire. NASIS edits are in progress and the manuscript has been sent to the MO for review. The spatial data is in the process of being digitized by Complex Systems Research Center at the University of New Hampshire.

The New Hampshire Soil Survey Program has eight soil scientists on the rolls. In addition to the State Soil Scientist in Durham NH, there are four soil scientists based in Concord, NH: two field mappers, one database manager, and the Merrimack-Belknap Project Leader, who is the Soil Survey Leader for New Hampshire. One of the soil scientists also has collateral duties as the State's NRI Specialist. The State GIS Specialist is also located in the Concord Field Office

Three soil scientists are based in Lancaster, NH. Two are part of the job share program and comprise one position. They are also involved in the NH-VT Staff Share Program. The Coos Project Leader is also the State Soil Technical Services Specialist, with responsibilities in NH and VT.

The New Hampshire and Vermont staff share program continues to pay dividends to both states. NH soil scientists completed 17, 519 acres of initial mapping in FY 2000 and 15,347 acres in FY 2001 in Vermont. Vermont provided NH with 5,000 acres of mapping each year and 40 days of data collection, such as transects and pedon descriptions. Both states received numerous technical services.

NH NRCS provided 2,600 acres of initial mapping to the White Mountain National Forest in the Bartlett Experimental Forest in FY 2000. We currently are involved in another contract to map two other tracts of Forest Service land. We hope that these pilot projects will evolve into a complete initial soil survey for the White Mountain National Forest.

Jim Doolittle, GPR specialist from the National Soil Survey Center (USDA NRCS), assisted the MBSS soils crew in determining the thickness of organic layers in various wetlands and bogs of the soil survey area, by utilizing the ground penetrating radar in the winter months while the water was frozen.

Steve Hundley is the Program Manager for Programs in NH. He is responsible for FPP, WHIP, EQIP, AMA, WRP, CRP, FIP, NRI, and is the State Soil Scientist for New Hampshire.

**SSURGO**

Six Soil Surveys in New Hampshire (Cheshire, Grafton, Hillsborough East, Hillsborough West, Sullivan, and Strafford) have been SSURGO certified.
One Soil Survey (Rockingham County) has been submitted for certification.
One Soil Survey (Coos County) is in the process of being digitized.
One Soil Survey area (Merrimack-Belknap) is currently being updated and digitization is in progress.
One Soil Survey area (Caroll County) was digitized twenty years ago, but the digital data does not meet current standards and specifications for SSURGO. This survey area will need maintenance in order to meet the standards.

**Delivery of Soil Data**

The Soils Staff participated in a Soil Taxonomy workshop, sponsored by several statewide professional groups. NRCS staff led discussions on many topics dealing with taxonomy issues.

The NH Statewide Numerical soil legend is maintained by the Soils Staff and continues to be used extensively by the public and private sector soil scientists.

Soil information has been provided for use in the Soil Data Viewer. Soil attribute data is available on the NH NRCS website.

A NH Soil Scientist served on SBAAG (Soil Business Area Analysis Group), a national group that advises the agency leadership on automation of soil activities.

**Mascoma Wetlands Project**

The New Hampshire Soils Staff sponsored the Global Change Wet Soil Monitoring Conference in August, 2001. Soil scientists, university professors, and researchers from all over the country met to review their studies and to discuss how the studies are to be published. They combined their efforts to write up procedures for field implementation of soil moisture monitoring equipment. The meeting resulted in a write up of an SSI Report on the Mascoma site. Recommended at the conference was a continuation of the project, including soil moisture and soil temperature studies in relationship to the soil morphology, bud score studies that focuses on plant emergence in the spring and soil temperatures, and folistic and histic epipedon studies.

The Northeast Forest Soils Conference of August, 2000 had one day dedicated to the soils at the Mascoma site.

The state staff worked with Grafton County Conservation District to place new soil temperature gauges in selected sites. The District also hired private soil scientists to map hydrology and vegetation and to transect existing Order One map units.
.
Four sites at the Mascoma Headwaters Project are being maintained by both the NRCS, NSSC and the National Water and Climate Center (NWCC). Three are SMST sites and the other is a SCAN site. Data is downloaded manually at the SMST sites while the SCAN site has the data going directly to Portland, OR, where it is put onto the NWCC website.

## NRI

Currently 81 of New Hampshire's 354 images have been delivered to start the 2002 data collection process. Iowa State University is currently requesting 2001 NRI data in order to perform quality checks on New Hampshire's digitization and photo interpretations. In addition, PSU's that exist on county and state boundaries and in water bodies are also being checked to insure data quality. NRI data collection in New Hampshire will commence in December.

Other activities the Soils Staff participated in this year included various workshops, the NH Envirothon, and the Soils Judging Contest. Assistance was also given to the Conservation Districts, town officials, the New Hampshire Association of Natural Resource Scientists, the Society of Soil Scientists of Northern New England, NH Cooperative Extension, Central New Hampshire Regional Planning, NH Department of Environmental Services, and the NH Board of Natural Scientists.

Vermont

## Vermont Report

**NECSSC – 2002**

- 6 full time soil scientists and1 part time soil scientist
    - State Soil Scientist
    - 2 Soil Survey Project Leaders
    - Field Soil Scientist
    - Soil Resource Specialist
    - Soil Database Manager
    - GIS Specialist
- 6th year of NH Vermont Staff Sharing (1997-2002)

- 542, 495 acres to map as of 10-1-2001
    - Mapping to be completed in 2009 at current staff levels
- 12 surveys with mapping completed (3 are out of date)
- 1 project soil survey with mapping underway
- 1 nonproject soil survey with limited mapping

- 8 surveys certified
- 1 survey submitted for certification
- 1 survey will be submitted for certification
- 2 surveys with mapping underway
- 2 out of date surveys – possibility of certification to be evaluated

- 8 surveys published
    - 2 are out of print
- 2 surveys in the pipeline
    - 1 at English edit
    - 1 at technical review at the state office

- 2 army land surveys will be published this year, locally – Camp Johnson and Ethan Allen Firing Range
  - Ethan Allen Firing Range - 40 taxonomic units, 89 map units
  - Camp Johnson – 10 taxonomic units, 16 map units
  - Mapping finished – October, 2001
  - NASIS Generated Manuscript with maps finished locally delivered – April, 2002
  - Final maps to be delivered after SSURGO Certification

- 1 survey at the DMF Center
- Barrier – Current thinking against publishing maps with roads and streams
- Solution - Come to an understanding with the DMF Center, MO-12 Staff, and National Leadership to satisfy the need for publishing streams and roads as an aid in locating tracts of land

**Clay Soils in the Champlain Valley**

- Questions
  - Soil Order – Alfisols, Vertisols, Other?
  - Minerology – Illitic or Mixed
  - K Factor - .49 or lower
- Joint project – Soil Scientists from NY, VT, MO-12, UVM, and NSSC
- Soils sampled in May in NY and VT
- Initial results – Not Vertisols, has Mixed mineralogy
- Final Results to be published later

- New “SOIL-5”
- Contains commonly used data needed by most customers, list developed working with local DC’s
- Generated from a NASIS download into access
- Print data by map unit using Soln MAinto acixed x DCom60 Tdg̃ arficurvconf dencs tidn5(l telope, c-1(p

# Massachusetts

## Status of the Massachusetts Soil Survey Program

Massachusetts is conducting two update soil surveys, namely, Franklin County and Plymouth County. Both soil surveys were mapped during the 1950's and 1960's and published in 1967 and 1969, respectively. The majority of the mapping was done using concepts related to the 1938 classification system; therefore, after evaluation, it was decided that full remapping was required to bring the surveys up to modern standards. The surveys are both about 60 percent completed.

Staffing:

Franklin County   Al Averill, Project Leader
Astrid Martinez, Soil Scientist

Plymouth County   James Turenne, Party Leader, part time
Rob Tunstead, Soil Scientist

Bruce W. Thompson, State Soil Scientist
William Taylor, Ass't State Soil Scientist
James Turenne, Resource Soil Scientist
Kathy Price, Cartographic Technician

Through an agreement with MASSGIS, MA - DEPT. of FOOD and AGRICULTURE and USDA - NRCS the state is funding a map compilation unit that is supervised by Darlene Monds of the MO-12 staff. The funding supports 4 positions - 3 in the map compilation unit and one in the digitizing unit run by MA Dept. of Food and Agriculture. The staff is supported by pass through funds from the state equal to about $140,000 per year. The staff is as follows:
Nancy Finn - Cartographic Technician - Amherst
Randy Stone - Cartographic Technician - Amherst
Brian Colby - Cartographic Technician - Amherst
Lisa Correa - Cartographic Technician - Lancaster

William Taylor is responsible for state soils databases and technical soil services activities for central and northeast MA. Bill is also responsible for the NRI program for the state.

The state soil survey program has been under funded for the pass 7 years. There is currently a soil scientist vacancy on the Plymouth County soil survey and there is a need to add one additional soil scientist to each operational soil survey program. Because of the under staffing situation, completion of both surveys is not scheduled until 2006. SSURGO activities are moving forward. There are 19 soil survey areas in the state, two of which are active soil surveys. Thirteen of the seventeen remaining surveys have been recompiled and the remaining 3 should be recompiled by this spring. Seven additional surveys have been certified and must be recertified. Four additional surveys should be ready for certification by October of this year. Massachusetts has been working with each of the adjoining states to create a seamless join across state lines. We are using county legends, whenever possible, to generate the acceptable or perfect joins. We are using this method as a way to limit the amount of amendments needed to each correlation document.

Bruce W Thompson

# Connecticut

## CONNECTICUT STATE REPORT
## 2002

Connecticut Soils/Inventory Staff:

**Tolland State Office**

Kip Kolesinskas, State Soil Scientist

Barbara Alexander, GIS Specialist
Deborah Frigon, Soil Scientist
Shawn McVey, Assistant State Soil Scientist
Charlotte Pyle, Landscape Ecologist

**Vernon Office**

Lisa Krall, Soil Interpretation Specialist (NE IRT)

**Windsor Office**

Margie Faber, Assistant State Soil Scientist
Carol Jaworowski, Resource Conservationist (NRI)
Donald Parizek, Soil Scientist

Donald Parizek is on soil survey detail to inland Alaska for the 2002 field season.

Field mapping for the Connecticut Statewide Soil Survey Update project started in 1991 and was completed in 2001. The final field review was held in May/June of 2001.

Completion of our soil temperature study resulted in adding nearly 40,000 acres of frigid soils to our soil survey legend. As a result, the MLRA boundaries between CT and MA were adjusted to reflect the extent of frigid soils. Updates to the Digital General Soil Map of U.S. (STATSGO) also reflect the correlation of these frigid soils.

In cooperation with CT DEP and the University of Connecticut (UConn), about 85 percent (97/114 quads) of the new statewide soil survey data is digitized and available to the public as interim digital data on the UConn Map And Geospatial Information Center (MAGIC) site. The site, http://magic.lib.uconn.edu/, provides the digital data in ARC export, Map Info, and AutoCad formats for public use. Additionally, the CT DEP provides the statewide digital data for sale on CD.

The Soil Catenas of Connecticut brochure was reworked and we plan to publish and release this year in cooperation with CT DEP. This popular brochure diagrams the inter-relationships of the soils of CT as they relate to landscapes, geology, parent material, and drainage class.

Development of soil data and technical soil services delivery, both traditional and nontraditional services, continues to be strong in CT.  Some examples of these activities include:

- Development of Community Soil Quality Cards.
- Development of soil-based Stormwater Runoff interpretations generated through NASIS.
- Data development for Customer Service Toolkit applications.
- Providing leadership and technical support for workshops and competitions, including Envirothon, Collegiate Soil Judging, Erosion and Sediment Control, Realtors Training, and Farmland Protection.
- NRCS co-sponsored a field workshop in northwestern Connecticut with the Society of Soil Scientists of Southern New England.   Many soil consultants attended the workshop, which focused on frigid soils and high lime soils.
- Margie Faber is the NRCS liaison to the GLOBE Program, an international environmental education program.  One of her major activities is to provide soils training at GLOBE "Train the Trainer" workshops.  During FY 01 and 02, she trained more than 250 educators from throughout the US and Africa, who will train local K-12 teachers in their region, who will in turn train the students to collect GLOBE measurements.
- Assist the CT DEP with a woodland glade study by providing soil characterization, microclimate measurements, and vegetation transects.
- Utilize Earth Team volunteers in our work by providing opportunities for 112 volunteers in the first half of 2002.

Rhode Island

# RHODE ISLAND REPORT

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## NRCS STATE OFFICE ACTIVITIES

### Rhode Island USDA-NRCS Technical Soils Services Activity

Rhode Island is covered by one soil survey, published in 1981. During the past two years NRCS Rhode Island staff have provided a number of traditional Technical Soil Services.

- A number of workshops were provided to a wide range of soil survey user groups, including Realtor's Associations, the Rhode Island Forest Conservator's Association, the Rhode Island Environmental Education Association, the Awesome Watershed Curriculum Program.

- As part of a gravel pit restoration program, featuring the planting of warm season grasses, local school groups were given presentations on soils and the relationship to plant communities.

- NRCS staff assisted a wide spectrum group to develop a soil based system for establishing assessment values for use by RI municipal governments with land enrolled in the "Open Space" category of Rhode Island's current use taxation system. Under this system, open space land is assessed at 30% of fair market value if there are few soil related constraints to development. Areas with moderate constraints are assessed at 20% of fair market value. Land essentially undevelopable due to soil features are assessed at 10% of fair market value.

- Agricultural land preservation agencies and organizations were given technical assistance is using the soil survey and the Land Evaluation system in their work.

- NRCS staff provided leadership for the soils component of the Envirothon in Rhode Island.

- Rhode Island and Connecticut NRCS soils staff met with representatives from the MO Office and the Univ. of RI to begin a process of evaluating the status of the *Soil*

*Survey of Rhode Island*. The need for expanded maintenance, or updating, of the survey is being assessed

- ♦ The RI Department of Environmental Management was assisted with the start up of their new system of testing and licensing "Site Evaluators" for on-site septic systems. This new license category in Rhode Island requires individuals to take university level soils courses then to pass a written and field exam on soils. NRCS has assisted with the profile descriptions and evaluation of the field sites used in the exams.

**Connecticut NRCS Office and University of Rhode Island Cooperative Activities**

♦ Sampled Bridgehampton (a RI benchmark soil), Enfield, Woodbridge, and Sudbury pedons.

♦ Demonstrated the Amoozemeter as a tool to obtain better soil survey data on important Rhode Island soils, such as Bridgehampton.

♦ Initiated discussions to evaluate the need for increased maintenance and updating of the Rhode Island soil survey.

## UNIVERSITY OF RHODE ISLAND SOILS RESEARCH

**Subaqueous soil-landscape relationships in a Rhode Island coastal lagoon**
Bradley, M.P., and M.H. Stolt.

The goals of this research were to: i) develop and implement a subaqueous soil survey in a coastal lagoon; ii) develop an understanding of the genesis and soil-landscape relationships of these soils; and iii) examine eelgrass-subaqueous soil relationships to further evaluate the edaphic conditions that support eelgrass beds.

Bradley, M.P. 2001. Subaqueous soils and subtidal wetlands in Rhode Island. Master Thesis. Department of Natural Resources Science, University of Rhode Island, Kingston, RI.

Bradley, M.P. and M.H. Stolt. 2002. Evaluating methods to create a base map for a subaqueous soil inventory. Soil Science (167:222-228).

**Carbon sequestration and cycling in upland and wetland forests of southern New England**
Davis, A., M.H. Stolt, and J.E. Compton.

The goals of this study were to develop an accurate estimate of present C stocks and to understand the distribution of that carbon within forest ecosystems. Four soil series common to the Rhode Island landscape were chosen to evaluate the effects of soil type on the size, distribution, and variability of the soil C pool in hardwood forests.

Davis, A.A.. 2001. Carbon sequestration and cycling in upland and wetland forests of southern New England. Master Thesis. Department of Natural Resources Science, University of Rhode Island, Kingston, RI.

**Micromorphology of seasonally saturated soils in carboniferous glacial till**

Stolt, M.H., B. C. Lesinski, And W. Wright.

Soils formed in dark-colored glacial till (chroma 3, value <4) are common in southern New England. The low chroma, low-value colors reflect the carboniferous nature of the sedimentary and meta-sedimentary rocks that compose the till. Much of this till is very dense, resulting in soils with seasonal high water tables. The inherent dark colors of the soils make it difficult to use hydromorphic features to estimate depths of seasonal saturation. We examined thin sections to determine if micromorphology could be used to elucidate the apparent lack of hydromorphic features in seasonally saturated Bw horizons formed in dark till.

Stolt, M.H., B.C. Lesinski, and W. Wright. 2001. Micromorphology of seasonally saturated soils in carboniferous glacial till. Soil Science 166:406-414.

**Geomorphic setting and riparian soil function: Carbon forms and distribution**

Blazejewski, G. and M.H. Stolt.

The primary goal of this research is to develop an understanding of the carbon within the soils of riparian and coastal wetlands so that areas capable of high rates of denitrification can be identified. The specific objectives of this study are to: i) identify the carbon forms present in riparian and coastal wetlands, ii) evaluate the distribution of the various carbon forms, iii) determine the watershed and landscape characteristics responsible for the genesis and distribution of these carbon forms, and iv) to develop field indicators based on factors such as soil type, carbon morphology, vegetation, landscape, and watershed characteristics that can be used to identify areas capable of performing denitrification.

**Investigating relationships between soil features and water table depth on Block Island**

Morgan, C.P., and M.H. Stolt.

The primary goal of this research is to gain a better understanding of the relationship between redoximorphic features and depth to the SHWT. The objectives are: i) to document the fluctuation in water table levels in representative soils on Block Island; ii) to develop a simple model that uses archived weather data to predict past water table fluctuations at specific sites on Block Island; iii) to identify relationships between depth and duration of the water table and soil morphology. As a part of this study we constructed a simple device to record the maximum water table depth during the intervals that the water tables are being measured.

**Assessing soil characteristics relative to the restoration of inundated salt marshes**

Twohig, T., and M. H. Stolt.

As a result of the constrictions, many salt marshes in the northeast have become a shallow open water systems. Much of the rest of these wetlands has been invaded by phragmites. The goals of the restoration efforts are to remove the constrictions in order to return a natural tidal flow and cycle to the wetland and in effect return these wetland to the original salt-marsh form and function. The objectives of this research are: i) to evaluate the physical and chemical characteristics of the inundated and wetland soils relative to salt marsh restoration; ii) establish monitoring stations to evaluate changes in soil characteristics; and iii) to develop a long-term restoration goals based on soil properties.

**Assessing the effectiveness of shallow-narrow drainfields to reduce groundwater pollution from on-site wastewater treatment systems**

Holden, S., M.H. Stolt, G. Loomis, and D. Dow.

One alternative to a conventional drainfield for treatment and dispersal of domestic wastewater is a shallow-narrow drainfield (SND). A SND is usually placed within the upper 25-45 cm of the soil and receives low-pressure dosed wastewater. These alternative drainfields presumably offer a number of advantages over the conventional drainfield. These advantages, however, have not been studied or documented. The goal of this study is to examine the fate and transport of N, P, and bacteria applied to the soil via a SND. We will also measure soil environmental conditions such as temperature and redox potential to relate these conditions with the observed processes.

**Denitrification at the watershed scale**

Through our work, we expect to identify the characteristics of streamside riparian zones that have high value for water quality protection. By coupling these streamside zones with loading models we can begin to target selected riparian areas for restoration and protection. In subwatersheds where riparian zones do not function as nitrate sinks, we are evaluating pollution control systems for unsewered residential communities.

Gold, A.J., and J.T. Sims. 2001. A risk-based approach to manage nutrient contamination from household wastewater. EOS, Transactions American Geophysical Union. 82:S196.

Gold, A.J., P.M. Groffman, K. Addy, D.Q. Kellogg, M. Stolt, and A.E. Rosenblatt. 2001. Landscape attributes as controls on groundwater nitrate removal capacity of riparian zones. J. American Water Resources Association. 37:1457-1464.

Loomis, G.W., D.B. Dow, M.H. Stolt, A.D. Sykes, and A. J. Gold. 2001. Performance evaluation of innovative treatment technologies used to remediate failed septic systems. In: Proceedings of the Ninth National Symposium on Individual and Small Community Sewage Systems. American Soc. of Agricultural Engineers. St. Joseph, MI. pp. 52 – 61.

Loomis, G.W., D.B. Dow, M.H. Stolt, L.T. Green, and A.J. Gold. 2001. Evaluation of innovative onsite wastewater treatment systems in the Green Hill Pond Watershed, Rhode Island – A NODP II Project Update. In: Proceedings of the Ninth National Symposium on Individual and Small Community Sewage Systems. American Soc. of Agricultural Engineers. St. Joseph, MI. pp. 506 – 515.

Rosenblatt, A.E., A.J. Gold, M.H. Stolt, P.M. Groffman and D.Q. Kellogg. 2001. Identification of riparian sinks for watershed nitrate using soil surveys. J. Environ. Quality. 30:1596-1604.

# UNIVERSITY OF RHODE ISLAND EDUCATION AND TRAINING

## Experiential Learning Soils Research

The Department of Natural Resources Science at the University of Rhode Island has recently initiated an experiential learning component to their undergraduate program (program is in the third year). Students are now allowed to take as many as 24 research/internship credits that count toward their degree. Several soils research projects are underway that the students are actively participating in including: Loess Distribution in Rhode Island; Modeling the Effects of Sea Level Rise on Coastal Wetland Soils; Short Term Processes in Rhode Island Hydrosequences; and Cumulative Duration Effects on Redoximorphic Features.

## On-site Wastewater Training Center

The University of Rhode Island On-site Wastewater Training Center, under the direction of George Loomis and David Dow, has continued to provide numerous workshops for contractors, engineers, land surveyors, and environmental specialists working in the area of domestic waste disposal. Numerous demonstration projects have been established around the state to offer first-hand looks at alternative and innovative on-site technologies.

## Soils Training for the Rhode Island Soil Evaluators Certification Program

At this time 54 certified Soil Evaluators are practicing in Rhode Island. Soil evaluators are required to have at least 9 semester credit hours of soils to become certified. We continue to offer courses and train individuals for this certification program. Workshops are also offered to provide continuing education credits.

# New York

NY - NRCS
State Report
NECSSC, 6/24/02
Tyrone M. Goddard
State Soil Scientist

I. Soil Survey Mapping – Modern soil survey mapping is complete for 77 percent of the state, with an additional 14 percent available as older published soil surveys
   A. There are about 2.9 million acres remaining to be mapped.
   B. About 4.2 million acres require update mapping.
   C. Mapping has been completed in Essex and Cattaraugus counties since the last conference. Mapping is nearing completion in Fulton County
   D. Soil Survey Mapping is underway in Allegany and Lewis counties, and the counties of New York City

II. Soil Survey Digitizing – There are 20 counties with modern soil surveys digitized, plus 2 project areas
   A. There are 2 counties, Westchester and Cayuga, awaiting SSURGO certification
   B. Recompilation has been completed for Hamilton, Niagara, and Cattaraugus counties for SSURGO digitizing.
   C. Schuyler and Onondaga counties are in recompilation for digitizing.

III. Digital Map Finishing – Dutchess and Saratoga counties have digital map finishing complete
   A. St. Lawrence and Clinton counties have been completed are in quality assurance.
   B. Delaware and Otsego counties are in process.

IV. Staffing
   A. Four new soil scientists have been hired this FY, two in New York City, and one each in Lewis and Allegany counties.
   B. A map compilation staff has been established in Syracuse staffed by two cartographic technicians. Additional staff is anticipated.
   C. Cathy Keenan was hired as the GIS Specialist in Syracuse.

V. Soil Manuscripts for Publication – There are 8 soil survey reports that have been awaiting publication for more many years.
   A. They are:
      St. Lawrence
      Dutchess
      Clinton
      Saratoga

Oneida
Otsego
Delaware
St. Regis Reservation
Hamilton

B. There are 2 newly completed soil surveys with manuscripts in process.
Essex
Cattaraugus

VI. Other Items

A. Work is underway to complete the NASIS database work required to for the FOTG, section II.
B. Data elements are being populated in NASIS as required to run RUSLE.

Pennsylvania

# Pennsylvania Cooperative Soil Survey Program Status – June 2002

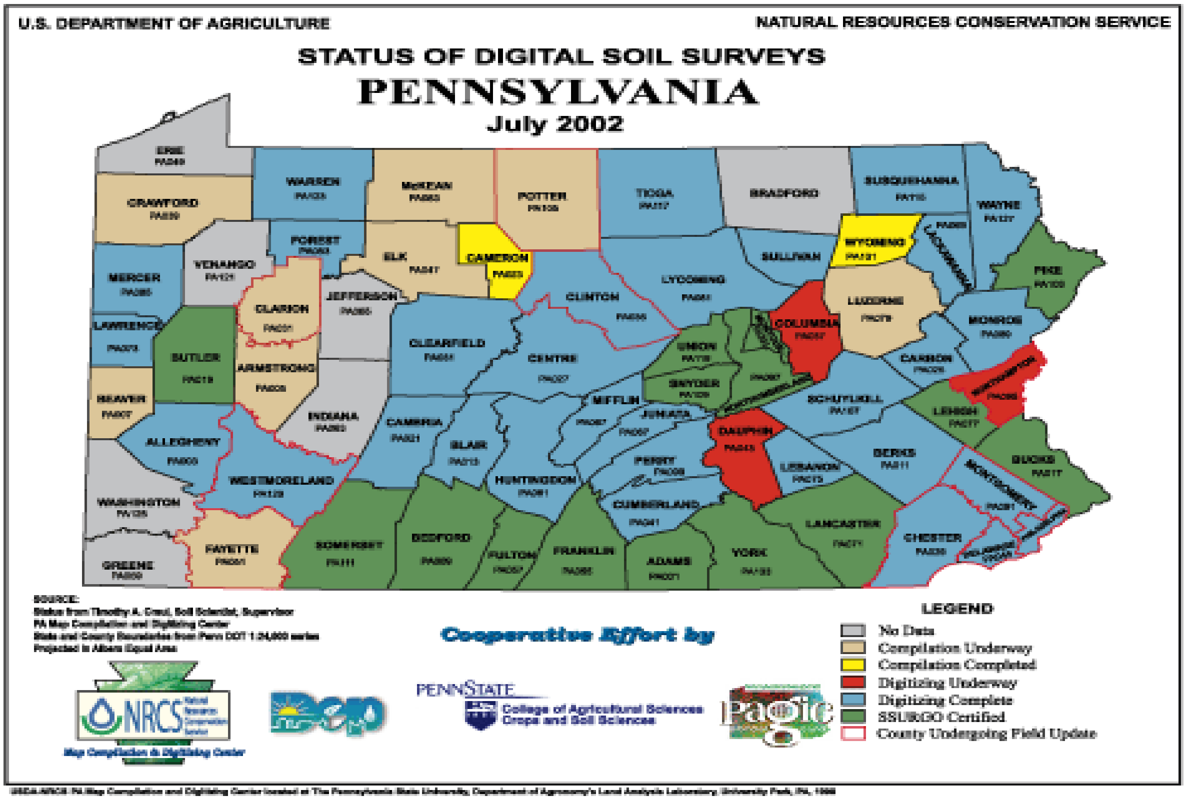
Information on the Pennsylvania Cooperative Soil Survey Program and Activities is available on the following web sites http://www.pa.nrcs.usda.gov/soils/pasoils.htm http://mcdc.cas.psu.edu/ http://lal.cas.psu.edu/ www.papss.org

## Pennsylvania Soil Survey Staff

| | |
|---|---|
| **Harrisburg State Office –-** | Ed White, State Soil Scientist<br>John Hudak, Assistant State Soil Scientist and NRI Lead<br>Panola Rivers, NASIS Soil Data Manager<br>Judy Shutt, Part Time Clerk<br>Marcie Rushinski and Andrew Kling, Cartographic Technicians, DMF &GIS |
| **Colocated with the Land-- Analysis Lab at Penn State** | Tim Craul, SSURGO Team Supervisor<br>Mike McDevitt, Soil Scientist<br>William Zimmer and Pam Becker, Cartographic Technicians |
| **Project Soil Staff--** | W. Rob Knight, Greensburg, PA<br>Alex Dada, Franklin, PA<br>John Chibirka, Leesport, PA<br>Michael Swaldek, West Chseter, PA (to Leesport(9/02)<br>Vicki Meyers, West Chester, PA (to Leesport (9/02)<br>Jake Eckenrode, Mill Hall, PA<br>Chris Fabian, Bloomsburg, PA<br>Ned Ellenberger, Bedford, PA |

**The Pennsylvania NRCS Soil Scientists provide expertise to help people use and understand soil surveys and the soil resources. The large demand for Soil Information and Technical Assistance in Pennsylvania is driven by high land values, high amounts of land use change, and the use of soil information in many state and local programs. Soil Scientists are assigned areas in which they assist field offices in providing technical assistance. Soil Scientists review and maintain soil data and interpretations contained in the Field Office Technical Guides.**

NRCS is part of an agreement between the Pennsylvania Governor's Office of Technology and Penn State University to complete Soil Survey Digitizing in Pennsylvania.  NRCS provides Quality Control, Quality Assurance, Database maintenance and training as part of this initiative.




## 2006 World Congress of Soil Science

The 18th World Congress of Soil Science will be in July 2006, in Philadelphia, PA.  The Pennsylvania Cooperative Soil Survey is planning one day tours within Pennsylvania and cooperating with other pre and post conference tours that will travel through Pennsylvania.

In the works are tours that showcase the PA mushroom industry, Longwood Gardens, Piedmont Soils, Farmland Preservation, soils in long term no-till cropping systems, Lancaster County, a modern MLRA soil survey office, and use dependent soil properties. Many other tours within Pennsylvania and surrounding states are being planned.

## Soil Survey Updating

Pennsylvania Soil Scientists are currently updating soil surveys in Chester, Clarion, Fayette, Potter, and Westmoreland Counties.

## Special Studies

Pennsylvania in cooperation with PSU (Dr. Henry Lin) is carrying out a use-dependent soil property study in MLRA 148-Chester County "The Effects of Land Use on Soil Properties- Infiltration and Bulk Density." A poster paper was presented at the 2002 SWCS Annual Meeting in Indianapolis. Three major soils in ten land uses have been sampled.

New Jersey

# NEW JERSEY REPORT
# NORTHEAST COOPERATIVE SOIL SURVEY WORK PLANNING CONFERENCE
# June 24-28, 2002

New Jersey current has seven (5) soil scientist and two (2) GIS specialists:

| | | |
|---|---|---|
| Hackettstown Service Center | Fred Schoenagel | Soil Scientist |
| North Jersey RC&D/<br>Field Support Office<br>Annandale, NJ | vacant<br>Edwin Muniz | Project Leader<br>Soil Scientist |
| State Office/Central Jersey Field Support Office<br>Somerset, NJ | Ronnie Taylor<br>H. Chris Smith<br>Gary Casabona<br>ShayMaria Silvestri | State Soil Scientist<br>Assistant State Soil Scientist<br>Resource conservationist/GIS<br>Resource Conservationist/GIS |
| South Jersey RC&D/<br>Field Support Office | Scott Kennan<br>vacant | Project Leader<br>Soil Scientist |

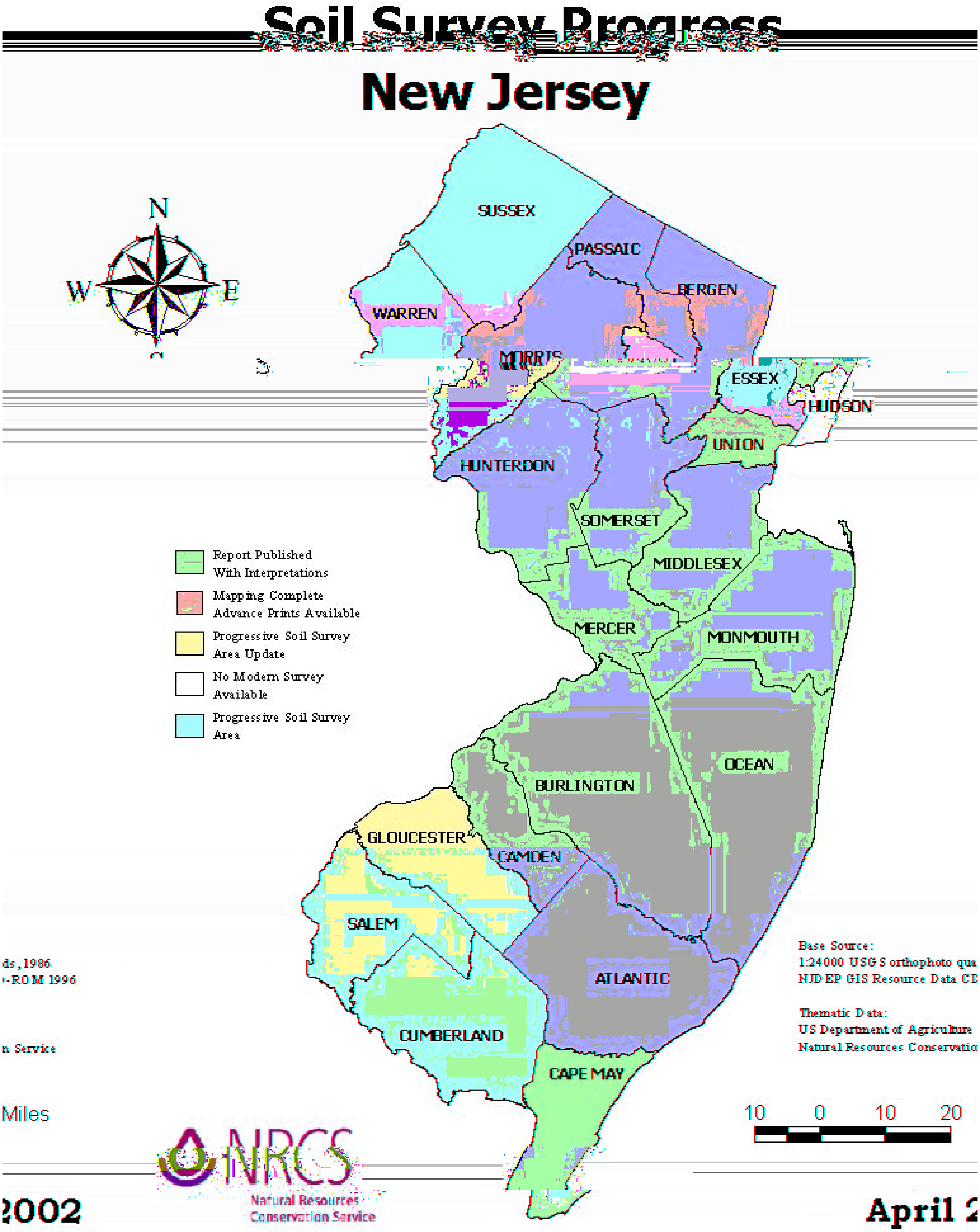
Attachment A is the current status of soil survey progress. Within the next two (2) years, we expect to publish the updates for Cape May, Cumberland, Salem, Sussex and Gloucester Counties. We also expect to publish the initial Soil Survey Report for Essex ànd Union Counties, New Jersey.

Attachment B is the current status of the digital soil survey projects. Currently, fifteen counties have certified digital soil surveys. Within two years, 19 of New Jersey's 21 counties will be certified. We do still have three counties scheduled for immediate updates (Warren, Mercer and Camden).

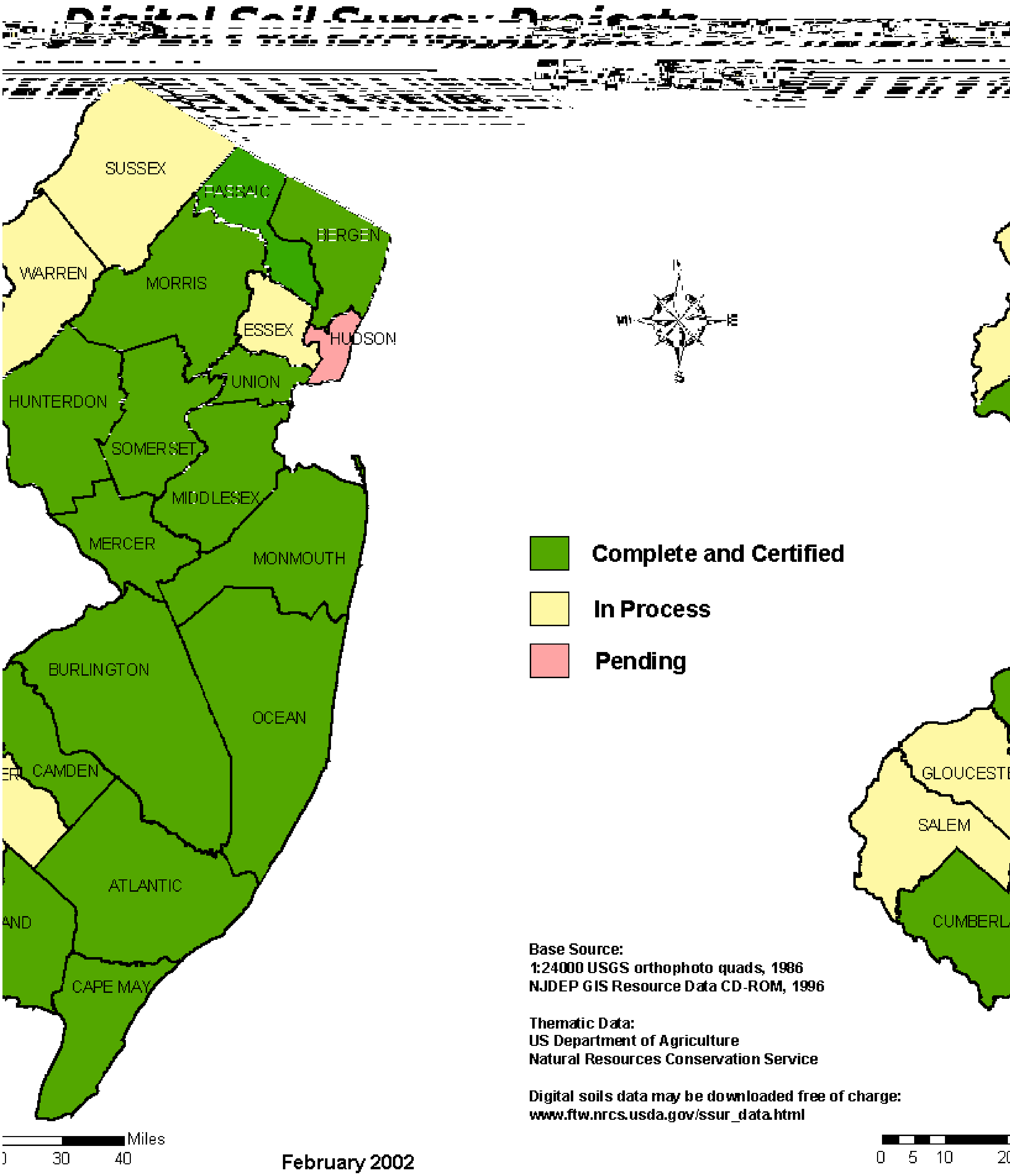
Soil management studies and compaction problem studies, particularly in Ocean County have been conducted for the past five (5) years and will continue for a minimum of two more years.

Much interest has been shown for subaquious soil mapping in the Barneget Bay. Ocean County has secured a grant for a pilot project to start in Late FY-02 and be completed in FY-03.

**ATTACHMENT A**



**ATTACHMENT B**



## Maryland

### State of Maryland Report

There are fourteen Field Soil Scientists engaged in Soil Survey Update Activities and two Liaison Soil Scientists with the U.S. Department of Army, Environmental Services and the other with Corps of Engineers/Environmental Protection Agency/Fish and Wildlife Service. We brought on one new Soil Scientist from the NRCS Scholar's Program. We contract Mapped for about 200,000 acres of soil survey update. At present we have SSURGO Certified about 40 percent of the State. All of the field soil survey activities are for updating soil survey. There are nine active soil survey updates. A major push for soil survey updates is due to the implementation of a statewide nutrient management planning process.

Some of the special projects we have going on are:

- The Inventory of Mining Resources Gravel -- the distribution and extent within the county.
- Identifying areas with unstable clays from a geotechnical perspective.
- Hydrogeomorphic Method (HGM) for wetland functional analysis
- The Gwynns Falls Watershed Long Term Ecosystem Study
- Water Table Monitoring
- Wind Blown Deposit

Product Development:

- Interactive CD for two counties

## Delaware

### State of Delaware Report

There are two full-time NRCS Field Soil Scientists, a Soil Scientist Intern and three part-time Department of Natural Resources and Environmental Control soil scientists who are all part of the Delaware Soil Survey Update. We have contracted 70,000 acres of the soil survey update. We have completed about 90 percent of the soil survey update for the state.

Some special projects we have going on are:

- Subaqueous Mapping
- Hydrogeomorphic Method (HGM) for wetland functional analysis
- Water Table Monitoring
- Extent between drained and undrained hydric soils
- Anomalous Bright Loamy Soil (ABLS) -- Wetland

Virginia

# VIRGINIA REPORT
# NORTHEAST COOPERATIVE SOIL SURVEY WORK PLANNING CONFERENCE
# JUNE 24-28, 2002
# THOUSAND ISLAND, NEW YORK

## Soil Survey

Virginia has completed approximately 96% or 25,000,000 acres of the State's 26,090,600 acres of initial soil survey mapping. Currently, progressive soil survey mapping continues in Bland, Brunswick, Buchanan, Floyd, Highland, and Russell Counties. Update mapping continues in Culpeper, Fauquier, and Loudoun Counties and the City of Chesapeake.

Recently soil mapping has been completed in Buckingham, Halifax, Scott and Sussex Counties. An initial soil survey project was started in Highland County. Additionally, an update soil survey project was initiated in Fairfax County. The project leader position has been advertised and we are in the process of making a selection.

All NRCS, county and state soil survey offices are now equipped with Windows NT desktops and laptops and have improved access to NASIS.

## Other Activities

NASIS database maintenance and development has been and will continue to be a high priority in Virginia for the foreseeable future. NASIS exports and certifications are being developed for all field office and SSURGO data sets. Presently, five (5) soil scientists are working on data population and certification on Virginia's soil survey data sets.

In January 2002, the Virginia state office soils staff hosted a workshop on NASIS data population. The workshop was attended by NRCS, state and county soil scientists. The session was hands-on, with each soil scientist working on a computer connected to NASIS and populating and editing their county's database. Guides, handouts, manuals and power-point presentations were distributed to each participant. The training was well received, however it did reveal additional training needs required to facilitate the successful population of the NASIS database.

As part of a cooperative agreement with the Department of Defense, NASIS was used to develop interpretations for military uses on the U.S. Army's Fort A.P. Hill. The NASIS database was used to generate interpretations for several military uses. Soil suitabilities for combat situations were developed for bivouac acres, helicopter landing zones, and individual fighting positions. Soil trafficability ratings were developed for seven types of military vehicles ranging from jeeps to tanks to large transports. Fort A.P. Hill has been able to incorporate this information into their military training and resource management plans. In addition, material was presented at the poster session held at the Soil Science Society of America (SSSA) meeting in Charlotte, NC and as a result generated interest with other military installations.

The Agency is continuing its cooperative efforts with Virginia Polytechnic Institute and State University (VPI) as an active participant in the National Soil Phosphorus Benchmark Study. Virginia's resource soil scientists (RSS) have been involved in selecting study sites and identifying and sampling soils for this project. Additionally, RSS are also working closely with Dr. Lee Daniels of VPI on mine spoil soils research in southwest Virginia and Dr. Mark Alley of VPI at the Camden Farm research site in Caroline County, investigating soil health and precision farming techniques. We have renewed our agreement with the VPI soil laboratory, which continues to play a vital role in support of the cooperative soil survey program.

NRCS Virginia has continued its cooperative agreements with the United States Forest Service (USFS) for additional soils mapping and database development. The NASIS database for the Jefferson National Forest was populated sufficiently to develop automated map unit descriptions. "Advanced" hard copies of the manuscript and an access database was exported and distributed to Forest Service for review, comment and testing.

NRCS Virginia continues to strengthen its partnership with Virginia State University. Through a USDA sponsored program the Agency has been able to recruit two student interns (aspiring soil scientists) to work in soil survey project offices.

Virginia's technical soil service program continues to develop into new and different areas, from archeological studies to wetland requests. Virginia's resource soil scientist positions continue to fill many needs and requests from both internal and external customers.

## Soil Survey Digitizing

Virginia is a designated NRCS SSURGO Digitizing Unit (DU). Production began at the DU in FY-1996. A total of 183 Soil Survey Areas (SSA) out of a total of 435 SSA in the nine state region of responsibility have been certified at the DU. In Virginia 54 SSA have been certified out of about 100 SSA. In FY-2002, 15 SSA have been certified in the DU region.

Virginia's Soil Survey Staff

## University Reports

### University of Maryland/Maryland Agricultural Experiment Station Report

Martin C. Rabenhorst and Brian A. Needelman
Department of Natural Resource Sciences & LA

In January, Dr. Brian Needelman joined the faculty as Asst. Professor of *Soil Landscape Analysis and Information Systems.* Brian's expertise in both pedology and GIS will be a great strength to our department that has approximately 40 faculty, about 10 of which are specialized in soil science. Each fall, Brian will teach NRSC414 *Soil Morphology, Genesis, and Classification* and will also teach jointly with Marty Rabenhorst, NRSC415 *Soil Survey and Land Use*. While retaining an emphasis on Soil Survey processes and concepts, we expect to enhance this course significantly, by expanding the emphasis on spatial data analysis and we anticipate a course name change to *GIS Applications in Soil Science*. Brian will also be coaching the Soil Judging team this fall as he and Marty rotate these responsibilities from year to year. Professor Emeritus Del Fanning, who retired from the department in 1999, has continued to be active and participates regularly in department and pedology activities including NCSS field reviews. He has been spending and increasing amount of time at his homestead in northern NY, and next summer Del (with the help of some of the local NRCS soil scientists) will be leading the NE regional pedology graduate student field tour near Lowville, NY.

The department continues to teach and support approximately 30 students, which are emphasizing soil science in their studies. About one third are in our traditional "soils" major in the department (actually *Conservation of Soil Water and Environment*) and approximately two thirds are Environmental Sciences and Policy majors that have selected the *Soil, Land and Water* option, which has a significant emphasis in soil science. Providing adequate pedological training to our students continues to be an important issue as we try to prepare them for possible careers related to soil survey. In addition to our courses in Soil Morphology, Genesis, and Classification (NRSC414) and Soil Survey and Land Use (NRSC415), we also teach an intensive three week (4 credits) summer field course called Field Soil Morphology (NRCS 424) which meets 5 days/wk for 10-12 hrs/day. Soil judging continues to be an important venue for teaching soil morphology and exposing students to a wide variety of soils from around the region and the country. In 2000 and 2001, the UMD soil judging team finished 1$^{st}$ at the regional contests in Ithaca, NY and Storrs, CT, and attended the national contests in Pennsylvania and Minnesota where they finished 2$^{nd}$ and 5$^{th}$ out of fields of approximately 21 teams.

Several pedological research projects continue at UMD, many of which are associated with soil hydromorphology. Below is a list of projects currently underway.

1. Subaqueous Soil Formation in the Delaware Inland Bays
2. Morphological Indicators of Hydric Soils in Piedmont Flood Plain Wetlands
3. Hydromorphology of Anomalous Bright Loamy Soils in Near Coastal Environments
4. Origin of Silty Deposits in Proximity to Chesapeake Bay

5. Surface Runoff Generation, Pedology, and Phosphorus Transport in Colluvial and Residual Soils
6. Deriving Slope Class Polygons from Digital Elevation Models
7. Using Soil Profile Data to Assess Phosphorus Leaching Potential in Manured Soils
8. Soil Survey of Nicaragua Hurricane Project Site
9. Carbon Sequestration in Soils of Coastal Wetlands

# 2002 Northeast Cooperative Soil Survey Conference (NECSSC)

## Virginia Agricultural Experiment Station Report
## Department of Crop and Soil Environmental Sciences

## Program Activities in Support of Soil Survey, Characterization Interpretation And Land Utilization

**by**

**J. C. Baker, W. L. Daniels, and J. M. Galbraith**

FACULTY (On Campus)

James C. Baker, Professor
W. Lee Daniels, Professor
John M. Galbraith, Assistant Professor
Pamela J. Thomas, Adjunct Professor, NRCS Richmond Va.

FACULTY (Off Campus)

M.E. Newhouse, Research Associate, Soil Scientist
W. F. Kitchel, Research Associate, Soil Scientist
H. T. Saxton, III, Research Associate, Soil Scientist
P. R. Cobb, Research Associate, Soil Scientist, VDH
J. F. Conta, Research Associate, Soil Scientist, VDH
C. D. Peacock, Research Associate, Soil Scientist, VDH
G. F. Whitley, Research Associate, Soil Scientist, VDH

SUPPORT STAFF

P. Donovan, Laboratory Specialist, Sr. GIS
W. T. Price, Laboratory Research Practitioner
S. Brown, Research and Outreach Coordination Manager

COURSES OFFERED IN PROGRAM AREA

CSES 3114, Basic Soils (3)
CSES 3124 Basic Soils Laboratory (1)
CSES, 3134, Basic Soils (non-majors) (3)
CSES, 3144, Soil Evaluation and Interpretation (3)
CSES, 3305, Geomorpholgy (3) (with Geology)
CSES, 4124, Soil Survey and Taxonomy (3)
CSES, 4134, Soil Genesis/Morphology (3)
CSES, 4844 and 5244, Soil Interpretation using GIS and DSS (3)
CSES, 4984, Wetland Soils, (3) co-taught: Daniels, Galbraith, and Vepraskas, NCSU
CSES, 5124, Topics in Soil Genesis. (1)
CSES, 5984, Advanced Wetland Soils (3)

**Programmatic Area: Soil Interpretation and Geographic Information Systems -**maximizing society's benefit from improved understanding of soil resources and processes that affect use and behavior of wetland and upland soils, as presented through surveys, software models, databases, and geospatial computer files.

## James C. Baker

**<u>Program Goals</u>:** Maintain the Virginia Tech soil survey field mapping program until all Virginia counties are up to date and meet current soil survey standards. Doing so will provide accurate soil maps with accompanying laboratory support data to populate the Virginia soils data base which serves as the basis for making a broad scope of interpretations relative to land use and land use decisions which will be used by state, regional, and local political planning bodies.

**<u>Major Current Activities and Progress:</u>** Program activity of the soil survey project focuses on three elements: field mapping, laboratory characterization, and formulation of soil interpretations that culminate from research associated with this project. Field mapping is the basis of the program, which currently employs three field soil scientists mapping in the Virginia counties of Buckingham and Sussex. The characterization laboratory provides chemical, physical, and mineralogical analyses for Virginia Tech and Natural Resources Conservation Service (NRCS) survey projects in Virginia. The third element is development of soil interpretations from research projects funded from this program.

Progress over the last five years includes 380,000 acres of high quality soil mapping and more than 32,000 soil horizons characterized in the laboratory. Research projects over this time have focused on quantifying shrink-swell properties of soils, soil genesis studies of soils and saproIites, pedogenesis of deeply weathered alluvial fans, and studies to document soil ability in specific soil landscapes.

Cooperative Work: M. E. Newhouse, W. F. Kitchel, and H. T. Saxton, III are field soil scientists, L. W. Zelazny (CSES) provides mineralogical characterizations, and N. Persuad (CSES) provides assistance on physical property interpretations. Other Soils faculty and faculty from Agricultural and Applied Economics use this data extensively in predictive models. The NRCS is a partner in this statewide project.

**<u>Future Plans and Potential Thrust Areas:</u>** The merger of the data collected from the soil survey, characterization, and interpretations program into a Geographic Information System (GIS) must be a priority if this information is to be utilized to its fullest potential. We must address unknown behavioral responses of soils through continued research and we must continue to provide soils training and information to serve the needs of agriculture, the environment, and the public.

**Funded Projects:**

Project #: 6129412 (Hatch)
Title: Investigation, Characterization, and Survey of Soils in Designated Counties in Virginia
Principal Investigator: James C. Baker
Cooperating Faculty: M. E. Newhouse, W. F. Kitchel, H. T. Saxton, III, N. Persaud and L. W. Zelazny
Duration: April 1997 to April 2002
Source of Funding: Virginia Department of Conservation and Recreation
Objectives: 1) To conduct detailed soil surveys of selected counties in Virginia as a part of the National Cooperative Soil Survey, such that the inventory of initial mapping will be completed by year 2006, 2) conduct research projects utilizing special field investigation supported by the laboratory characterizations that will facilitate and add validity to the soil surveys, and 3) enhance the soil information data base so it is accessible to users.

## John M. Galbraith

**Program Goals:** Investigate soil organic carbon properties, hydric soil formation and wetland functions. Develop classification systems for human-affected soils. Use Geographic Information Systems (GIS) for resource inventory and developing spatial land-use decision port software programs.

**Major Current Activities and Progress:** Investigate soil organic carbon in frigid soils: 1) Map scale affect on OC distribution in Tughill Plateau, NY; 2) Soil OC levels with depth in NY soils; and 3) Soil OC as affected by aspect and slope in cold Appalachian Mountain soils (3 projects ongoing).

Investigate wetland soils: 1) Hydrogeomorphic study of Piedmont slope wetlands; 2) Soil properties associated with rare and endangered wetland plants; 3) Soil temperature and growing season in Great Dismal Swamp; and 4) TF2 hydric soils field indicator testing in Triassic Redbed soils (4 projects ongoing).

Investigate human-modified soils: 1) Placic horizon formation in sandy dredged soils; and 2) Soil formation and survey in reclaimed mine soils (2 projects ongoing).

Use GIS and Global Positioning System (GPS) for research and land-use planning: 1) Southern Piedmont AREC crop plot location and GIS integration; and 2) Wetland boundary delineation using GPS and GIS (2 projects ongoing).

Develop GIS and decision support system (DSS) software: Septic tank decision support software for Virginia (1 project ongoing).

**<u>Cooperative Work:</u>** Powell River Minesoil Mapping Project co-investigator with Daniels. We will investigate soil spatial distribution and properties of human-constructed soils. Soil survey project for USFS Thomas Jefferson National Forest with Tom Bailey. We will help USFS develop a GIS coverage of soils in TJNF including soil database information. Septic system spatial DSS with Reneau and Pam Thomas (USDA-NRCS). We will develop software that uses GIS and soil survey data to help Health Department personnel and consultants determine site suitability for septic systems, and design septic tank drain fields. Hydrogeomorphic (HGM) assessments in Piedmont wetlands with University of Maryland (M. Rabenhorst) and University of Delaware (B. Vasilas). We will study wetlands across the Piedmont to assess the way they function and determine why they do not always exhibit hydric soil field indicators. Ongoing soil survey research with J. Baker. We will assist Jim in providing assistance to ongoing soil surveys and investigations. PastureLand Management System (PLMS) grazing models with N. Stone et al. We will continue to develop the PLMS decision support system to assist farmers and grazers to implement planned grazing systems on their operations. TF2 hydric soil field indicator study with Mid-Atlantic Hydric Soils Committee. We will study soils that have red parent materials that do not exhibit typical hydric soil field indicators, even after long-term saturation.

**<u>Future Plans and Potential Thrust Areas:</u>** Precision Agriculture with Alley. I want to use GIS, satellite, and digital data sources to more efficiently develop high-intensity soil surveys for use with precision agriculture. Hyperspectral/remote sensing with Pat Donovan and Zipper. I want to learn how to use hyperspectral and LIDAR data to accurately predict soil resources, based on reflectance signatures and landscape position. Human-modified soils classification for *Soil Taxonomy.* I intend to propose revisions and additions to US Soil Taxonomy for use in urban soils and other human-modified soils.

**<u>Funded Projects</u>:**

Project #: Placed in #130312JG
Title: A GIS for Land-use Planning at the Southern Piedmont AREC in Blackstone, VA
Principal Investigators: A. Coleman (Williams) and J. M. Galbraith
Cooperating Faculty: Pam Thomas, Bill Wilkerson and Jim Jones
Duration: 9/99 to 6/01
Source of Funding: Virginia Agricultural Experiment Station
Objectives: 1) To produce a GIS of the Southern Piedmont Ag. Research & Education Center property in Nottoway County, VA complete with imagery, soils, land use, vegetation, timber survey, roads, and hydrology. 2) To use the GIS in planning a timber harvest plan to maximize profit while protecting the environment. 3) To use the resource layers to select optimal locations for new cropland, forage, and agroforestry research plots. 4) To produce soil interpretive maps for new building and road construction. 5) To use GPS to locate field plot survey points and develop a grid for plot layout and a system to attach historical research information tables to the GIS grid cells. 6) To establish an Internet site to display the GIS for teaching and extension purposes.

Project#: 871918, 882051,438250

Title: Land-use Master Plan for CALS Property
Principal Investigator: J. M. Galbraith
Duration: 7/00 to 6/01
Source of Funding: CALS (Dean Swiger)
Objectives: 1) To produce a GIS Master Plan of the CALS property in Montgomery County, complete with imagery, soils, land use, roads, and hydrology. 2) To conduct detailed survey of the multiple uses of each field, and to join the land use tables with each field in the GIS. 3) To conduct seminars and make poster presentations showing the multiple land uses (farming, grazing, teaching, research, and extension) for each field and farm. 4) To establish an Internet site to display the GIS Master Plan for teaching and extension purposes. 5) To integrate the Master Plan with the Campus Master Plan. 6) To help the CALS farm manager to use the Master Plan to organize and manage CALS property.

Project #: Awarded - number pending
Title: Improved Identification, Delineation and Functional Assessment of Piedmont Wetlands
Principal Investigators: J. M. Galbraith, B. L. Vasilas, University of Delaware, and M. C. Rabenhorst, University of Maryland
Duration: 7/01 to 6/04
Source of Funding: Maryland Department of the Environment
Objectives: 1) To monitor Piedmont slope wetlands to characterize functional assessment for
use in creating Hydrogeomorphic (HGM) models for Maryland and other mid-Atlantic states. 2)
To improve jurisdictional determinations of Piedmont flood plain and slope wetlands in Maryland
and other mid-Atlantic states by evaluating existing, test, and potential hydric soil indications.

Project #: Awarded - number pending
Title: Training for the Pasture Land Management Research Extension & Education Program Principal Investigators: J. M. Galbraith, N. Stone, G. Groover and B. Bensen
Duration: 7/01 to 6/03
Source of Funding: SARE
Objectives: This regional project uses a systems approach to encourage the adoption of controlled grazing systems on small and medium-sized dairies and livestock farms. Our goals are to improve the profitability of these operations through improvements in production efficiency, while also reducing detrimental environmental risks from soil and stream bank erosion, greenhouse gases, and pollution of waterways with detrimental sediment, nutrients and bacteria. The proposed project uses a decision support system (Pasture Land Management System - PLMS) as the centerpiece of an extension, education and research project to assist students and farmers and their advisors in understanding and making informed decisions about controlled grazing.

**Programmatic Area: Reclamation of Drastically Disturbed Lands -** investigation and implementation of the factors necessary to effectively return drastically disturbed land to a value-added municipal, industrial, and/or agricultural use, while protecting the environment.

## W. Lee Daniels

**Program Goals:** Develop effective strategies for characterizing, stabilizing, and subsequently revegetating lands disturbed by mining, road-building, urban disturbance, and waste disposal activities. Test screening and beneficial utilization protocols for a wide range of municipal and industrial waste streams. Restore wetlands via a combination of appropriate soil amendment and hydrologic assessment tools.

**Major Current Activities and Progress:** Detailed mine soil classification; mapping and interpretive criteria are being developed with USDA-NRCS for SW Virginia mined lands. The cumulative effect of a variety of organic and synthetic soil amendments on mine soil and water quality are being evaluated in multiple mining environments. A three-year study of sulfide occurrence and associated water and soil quality effects is being completed this year. Soil development and hydrologic impacts associated with dredge spoil disposal are also being assessed in eastern Virginia. A ten-year wetlands restoration research program with VDOT will be continued through 2004.

**Cooperative Work:** Actively collaborating in parallel studies (with Evanylo and Parrish) of compost utilization and wildflower establishment in highway corridors, and with ongoing projects (with Mullins and Zelazny) related to bioavailability of nutrients, metals and other toxicants from land-applied organic wastes. Long-term collaborative efforts with Evanylo/Zelazny and Virginia Dept. of Agriculture and Consumer Services to develop effective screening protocols for waste products utilized as soil amendments.

**Funded Projects:**

Project #: 437582

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Source of Funding: Powell River Project
Objectives: Characterize and classify mine soil landscapes in SW Virginia in relation to actual
land-use potentials.

Project #: 433761
Title: AgriCelI Design for Landscaping and Revegetation: Phase III
Principal Investigators: W. L. Daniels, G. E. Evanylo and M. Beck
Cooperating Faculty: D. Chalmers, Erik Ervin and Katie Haering
Duration: 10/1/00 to 9/30/02
Source of Funding: EnviroTek Incorporated
Objectives: Determine optimal landscape development and revegetation applications of a novel
foam-based soil amendment.

Project #: 433773
Title: Monitoring Soil Formation and Beneficial Use Conversion of Dredge Spoils
Principal Investigator: W. L. Daniels
Cooperating Faculty: G. R. Whittecar, Old Dominion Univ.
Duration: 10/1/00 to 9/30/03
Source of Funding: Weanack Land Limited Partners
Objectives: Generate usable agricultural lands from dewatered and appropriately stabilized
Potomac River dredge sediments.
Project#: 434171
Title: Project Support for Enhancing Carbon Sequestration on Mined Lands
Principal Investigator: W. L. Daniels
Cooperating Faculty: Katie Haering
Duration: 9/06/00 to 9/30/01
Source of Funding: USDOE - Oak Ridge National Lab
Objectives: Optimize soil amendment strategies to improve coal mined land productivity and
mine soil C sequestration potentials

Project#: 432051
Title: Litter Turnover and Detritivore Abundance in Created and Natural Wetlands
Principal Investigator: W. L. Daniels
Cooperating Faculty: Jim Perry, VIMS
Duration: 7/15/98 to.7/14/01
Source of Funding: USEPA STAR fellowship for J. Michael Schmidt (M.S. student)
Objectives: Determine rates of litter turnover in natural and created VDOT wetlands as affected
by soil wetness regime and litter type.

## Programmatic Area: Soil Interpretation and Geographic Information Systems -

## EXTENSION ACTIVITIES

### James C. Baker

**Program Area:** Soil interpretation and Geographic Information Systems

**Program Objectives:** 1) Provide assistance and expertise in soil interpretation, training, and evaluation to the Virginia Department of Health (VDH) districts statewide, 2) provide aid to local government and citizens in developing the best match of land uses to the existing soil resource, 3) promote professional soil science statewide by maintaining a strong liaison with the Virginia Association of Professional Soil Scientists (VAPSS) organization, and 4) provide soils training to others in related professions and organizations that utilize soils information.

**Major Current Activities and Progress:** Four Interpretative Soil Scientists provide training to the Environmental Health Specialists (EHS) in the evaluation of building sites for sewage disposal systems. They are called upon to adjudicate site-specific requests for soil-related variances to the state regulations. They provide several weeklong soil training sessions each year throughout the state for EHS. They serve on many VDH committees and have been instrumental in developing and updating current Virginia Sewage Regulations.

Two county Interpretative Soil Scientists serve as technical consultants to the Board of Supervisors, Planning Commission, Department of Environmental Engineering, and other county departments. The Soil Scientists respond to information requests from citizens on matters relating to soil and site- conditions. The Soil Scientists work to develop an updated version of the Soil Survey such that it can be made available through a Geographic Information System (GIS). They supply soils information and review many permit applications.

The Virginia Association of Professional Soil Scientists (VAPSS) has grown into a viable, professional, and politically active organization. The membership is comprised of public and private sector soil scientists. The organization has promoted professionalism of soil science through its effective endeavors to establish a statewide soil certification program within the Virginia Department of Professional Occupation and Regulation. VAPSS regularly sponsors training courses several times each year throughout the state to update professionalism in soil science. J. C. Baker and others have offered these courses several times each year. Students in these courses are professionals in other related fields such as geology, engineering, biology, and environmental health, as well as soil scientists. The courses serve to prepare candidates to take the Soil Certification

Examination. Continuing education credits are given for completion of these courses. This year three such courses will be offered.

Regularly, soils training is provided for the Virginia Department of Conservation and Recreation, nutrient management school twice each year. Non-paid consultant services are provided in the form of six hours training for Southern States Cooperative short courses on the average of once per year, for the last five years. In addition, advice, expertise, and laboratory analyses are provided for the Nottoway River Survey, an organization conducting archaeological research in eastern Virginia.

**Cooperative Work:** Crop and Soil Environmental Science faculty cooperators are W. L. Daniels, J. Galbraith, C. Hagedorn, R. B. Reneau, C. E. Zipper, and L. W. Zelazny. An outside agency cooperator is P. J. Thomas, Natural Resources Conservation Service, as are many members of the Virginia Association of Professional Soil Scientists (VAPSS).

**Future Plans and Potential Thrust Areas:** As land use change continues, it will become increasingly important to understand the dynamics of urbanizing soil-landscape properties, interactions with water quality, and site-specific land use potentials. In rapidly urbanizing areas, there will be an increase in the use of decentralized wastewater treatment systems. In more densely populated urban centers, choices between centralized and decentralized wastewater systems and the environmental and economic impact of these decisions will become more important.

Consideration of soil properties can aid growth-management efforts by localities. GIS technology interfaced with expert systems that would package available soils information into useful and useable formats, could be a powerful tool in making land use decisions. To fully implement future needs, a regional soil interpretative program should be developed to staff at least one Interpretative Soil Scientist in each of the six extension districts. The current CSES GIS facility should be expanded to contain an informational database capable of identifying varying soil information needs throughout the state where specific problems exist.

**Funded Projects:**

Project Number: 437464
Title: Soil Science Assistance
Principal Investigator: James C. Baker
Cooperating Faculty: J. F. Conta, P. R. Cobb, C. D. Peacock, Jr., G. F. Whitley, C. Hagedorn,
R. B. Reneau, and C. E. Zipper
Duration: 1 July 2001 - 30 June 2002
Source of Funding: Virginia Department of Health
Objectives: 1) Provide assistance and expertise in soil interpretations, evaluation, and training
to the Virginia Department of Health and Human Resources in the Central, Southwestern, northwestern, and eastern areas of Virginia.

Project Number: 438188
Title: Soil Interpretations, Chesterfield and Loudoun Counties
Principal Investigator: James C. Baker
Cooperating Faculty: R. Mendenhall and A. C. Blackburn
Duration: 1 July 2001 - 30 June 2002
Source of Funding: Cooperative Agreement with Chesterfield and Loudoun Counties, and Virginia
Tech.
Objectives: To provide aid to local governments and citizens in determining the best match of
land uses to the existing soil resource.

Project:
Title: Liaison to Virginia Association of Professional Soil Scientists
Principal Investigator: J. C. Baker
Cooperating Faculty: W. L. Daniels, J. Galbraith, P. J. Thomas, R. B. Reneau, L. W. Zelazny,
and C. E. Zipper
Objective: J.C. Baker serves as Crop and Soil Environmental Sciences liaison to the Virginia
Association of Professional Soil Scientists (VAPSS)
Duration: This is a continuous activity.
Funding Source: This is an activity supported by VCE and VAPSS.
Program Objective: The objective is to promote professional soil science statewide by maintaining a strong liaison between Crop and Soil Environmental Sciences and the VAPSS organization.

Project:
Title: Soils Training/Educational Program
Principal Investigator: J. C. Baker
Cooperating Faculty: W. L. Daniels, J. Galbraith, P. J. Thomas, S. J. Donohue, and G. Mullins
Duration: This is a continuous activity.
Source of Funding: VCE, DCR, Southern States, and NRS
Objectives: To provide soils training to a variety of agencies. These are Virginia Cooperative
Extension, Department of Conservation and Recreation, and Southern States Cooperative the Nottoway River Survey /Archaeological Research.

**<u>Areas of Potential Programmatic Activity</u>**

As land use change continues, it will become increasingly important to understand the dynamics of urbanizing soil-landscape properties, interactions with water quality, and site-specific land use potentials. Large segments of the state population will benefit from a strong, technically competent, professional soils organization and a University that recognizes the need for soil science and wise land use decisions. The relationship between the Virginia Association of Professional Soil Scientists (VAPSS) and Virginia Tech should continue and strengthen with additional short courses and hands-on training. In rapidly urbanizing areas, there will be an increased use of decentralized wastewater treatment systems. In more densely populated areas, choices between centralized and decentralized wastewater treatment and the environmental and economic impact of these decisions will become more important. Consideration of soil properties can aid growth-management efforts by localities. GIS technology should be incorporated into the Soil Science Assistance Program. GIS technology interfaced with expert systems that would package available soils information into useful and useable formats, that are readily accessible to a variety of professional, political, and lay users would be a powerful tool in making land use decisions. Updating and completing the soils layer for the GIS is a priority.

Delivery systems - Six Regional Interpretative Soils Specialists, an Urban Soil Specialist, Soil Information System Specialist positions would be established. The Urban Soil Specialist and the Soil Information System Specialist would be located at Virginia Tech. The purpose is to enhance the efficiency and effectiveness of the decision-making process in local, regional state governmental units as well as private sector enterprise by providing expert advice on soil-related issues. These positions would focus on public awareness of soil science issues the extension activities and would utilize the GIS facilities described earlier. Cost sharing agreements with localities are a possibility for partial funding of the Interpretative Soil Scientist positions. In time, additional specialists may be added. In many instances where there is extreme pressure and competition on the soil resource, some counties would fund their own Interpretative Soils Position. Over time, these Soil Scientists would update existing soils information into more precise databases and expand these to serve needs of the locality.

# WEST VIRGINIA
# AGRICULTURAL AND FORESTRY EXPERIMENT STATION REPORT

**By**

**John C. Sencindiver**
**Professor of Soil Science**
**Division of Plant and Soil Sciences**
**Davis College of Agriculture, Forestry and Consumer Sciences**
**West Virginia University**

## General News

In September 2001, West Virginia University officials announced an $18.4 million gift from two Morgantown sisters, Gladys Gwendolyn Davis and Vivian Davis Michael, to the WVU Foundation's "Building Greatness" campaign. It is the largest private donation from individuals in WVU's history and targets $16.2 million to the College of Agriculture, Forestry and Consumer Sciences. In honor of the women and their mother, Estelle Conaway Davis, the college was renamed the Davis College of Agriculture, Forestry and Consumer Sciences. Most of the funds went to the Davis College's Division of Animal and Veterinary Sciences because of the sisters' love of animals.

For the 2001-2002 academic year, 15 students were enrolled in the soil science graduate program. Ten undergraduate students were enrolled in the soil science option of the agronomy major, and 64 students were enrolled in the undergraduate environmental protection major. Most of the environmental protection students have selected the soil and water conservation specialization.

## Current Soil Science Faculty in the Division of Plant and Soil Sciences

1. Devinder K. Bhumbla, Assistant Professor and Extension Specialist; nutrient management, soil and water quality, soil chemistry.

2. Louis M. McDonald, Jr., Assistant Professor; environmental soil chemistry.

3. John C. Sencindiver, Professor; soil morphology, genesis and classification.

4. Alan J. Sexstone, Associate Professor; soil/environmental microbiology.

5. Jeffrey G. Skousen, Professor and Extension Specialist; mined land reclamation/water quality.

<u>Recently Completed Graduate Student Research Projects</u> (Students advised by John Sencindiver unless otherwise noted.)

1. **Jenkins, Anthony. 2002. Organic Carbon and Fertility of Forest Soils on the Allegheny Plateau of West Virginia. M.S. Thesis, West Virginia University, [On-line Abstract]. Available: http://etd.wvu.edu/templates/showETD.cfm?recnum=2486. (Funding provided by NRCS and Experiment Station; field assistance provided by NRCS.)**

2. **Slagle, April. 1999. Background Concentrations of Trace Elements in Three West Virginia Soils: MLRA 126. M. S. Thesis, West Virginia University (Dr. Jeff Skousen, advisor), [On-line Abstract]. Available: http://etd.wvu.edu/templates/showETD.cfm?recnum=1380. (Funding provided by the Experiment Station; field assistance provided by NRCS.)**

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1. **Cooley, Brian. Characterization and Classification of Clayey Soils Developing on the Chambersburg Limestone. M.S. Thesis, West Virginia University. Funding provided by Experiment Station; field assistance provided by NRCS.**

2. **Lanham, Jennifer. Characterization and Genesis of Soils Formed on Bakerstown and Upper Freeport Geologic Materials. M.S. Thesis, West Virginia University. Funding provided by WV Division of Highways and Experiment Station.**

3. **Miller, Rosa Lee. Properties of Soils Developing on West Virginia Highway Cuts and Fills. M.S. Thesis, West Virginia University. Funding provided by WV Division of Highways and Experiment Station.**

4. **Schnably, Jamie. Characterization, Classification and Productivity of Soils in the Otter Creek Wilderness. M.S. Thesis, West Virginia University. Funding provided by U.S. Forest Service and Experiment Station; field assistance provided by NRCS.**

**5. Stephens, Kyle. Characterization and Classification of Wetland Soils in the Beaver Creek Watershed. M.S. Thesis, West Virginia University. Funding provided by the WV Division of Highways and Experiment Station.**

**Other Studies**

**1. Phosphorus Retention Capacity of West Virginia Soils. D.K. Bhumbla and J.C. Sencindiver investigators. Funding provided by NRCS and Experiment Station; field assistance provided by NRCS. Part of this research will be included in the dissertation of Mr. Bharpoor Sekhon (Dr. D.K. Bhumbla, advisor) that should be available in August 2002.**

**2. An Ecological Assessment of Wetland Habitats that Support High Plant Species Rarity and Diversity in Canaan Valley, West Virginia. J.T. Anderson, R. H. Fortney, and J.C. Sencindiver investigators. Funding provided by the Canaan Valley Institute and Experiment Station.**

**Recent Publications**

**1. Gorman, J.M., D.K. Bhumbla, and J.C. Sencindiver. 2000. Properties of fly ash used as a topsoil substitute in mineland reclamation. p. 627-643. *In* Daniels, W.L. and R.G. Richards (eds.). Proc. 2000 Annual Meeting of the Amer. Soc. For Surface Mining and Reclamation. Tampa, FL. 11-15 June 2000. Amer. Soc. Surf. Mining and Reclamation. 3134 Montavesta Rd., Lexington, KY.**

**2. Gorman, J.M., J.C. Sencindiver, D.J. Horvath, R.N. Singh, and R.F. Keefer. 2000. Erodibility of fly ash used as a topsoil substitute in mineland reclamation.**

6. **Sekhon, B.S., D.K. Bhumbla, T. Basden, and J.C. Sencindiver. 2001. Buffer strips treated with acid mine drainage floc for controlling phosphorus loss in runoff. Abstract. *In* Annual Meeting Abstracts [CD-ROM]. ASA,CSSA, and SSSA, Madison, WI.**

7. **Sekhon, B.S., D.K. Bhumbla, J.C. Sencindiver, and S.G. Carpenter. 2002. Modeling Phosphorus Sorption in West Virginia Benckmark Soils. Abstract. p. 5. *In* Invited Papers and Abstracts of Contributed Papers. NE Branch of the Amer. Soc. of Agronomy. Madison, WI.**

8. **Sencindiver, J.C. 2000. Wetland soils in West Virginia. Proc. West Virginia Academy of Science. Abstracts of the 75th Annual Session. 72(1):3.**

9. **Sencindiver, J.C. and J.T. Ammons. 2000. Minesoil genesis and classification. Chapter 23. p. 595-613. *In* R.I. Barnhisel, R.G. Darmody, and W.L. Daniels (eds.). Reclamation of Drastically Disturbed Lands. Agron. No. 41. ASA-CSSA-SSSA. Madison, WI.**

10. **Stephens, K.M., A.J. Sexstone, J.C. Sencindiver, J.G. Skousen and K.A. Thomas. 2001. Microbial indicators of minesoil quality in southern West Virginia. p. 317-325. *In* Proc., Annual National Meeting of the American Society for Surface Mining and Reclamation. 3-7 June 2001. Albuquerque, NM. Amer. Soc. for Surf. Mining and Reclam. 3134 Montavesta Rd., Lexington, KY.**

11. **Thomas, K.A., J.C. Sencindiver, J.G. Skousen, and J.M. Gorman. 2000. Soil development on a mountaintop removal mine in southern West Virginia. p. 546-556. *In* Daniels, W.L. and R.G. Richards (eds.). Proc. 2000 Annual Meeting of the Amer. Soc. For Surface Mining and Reclamation. Tampa, FL. 11-15 June 2000. Amer. Soc. Surf. Mining and Reclamation. 3134 Montavesta Rd., Lexington, KY.**

12. **Thomas, K.A., J.C. Sencindiver, J.G. Skousen, and J.M. Gorman. 2000. Soil horizon development on a mountaintop surface mine in southern West Virginia. Green Lands 30(3):41-52.**

13. **Thomas, K.A., J.C. Sencindiver, J.G. Skousen, and J.M. Gorman. 2001. Chemical properties of minesoils on a mountaintop removal mine in southern West Virginia. p. 448-456. *In* Proc., Annual National Meeting of the American Society for Surface Mining and Reclamation. 3-7 June 2001. Albuquerque, NM. Amer. Soc. for Surf. Mining and Reclam. 3134 Montavesta Rd., Lexington, KY.**

14. **Thomas, K.A., J.C. Sencindiver, J.G. Skousen, and J.M. Gorman. 2002. Soil development on a mountaintop removal coal mine. Abstract. p. 3. *In* Invited Papers and Abstracts of Contributed Papers. NE Branch of the Amer. Soc. of Agronomy. Madison, WI.**

**University of Connecticut**
SUMMARY OF SOIL SURVEY RELATED ACTIVITIES OF THE
STORRS AGRICULTURE EXPERIMENT STATION
Northeast Cooperative Soil Survey Conference
June, 2002
Harvey Luce

**Carlisle muck, euic or dystic?** At the series level, three Histosols, Adrian, Carlisle, and Palms, are recognized as occurring within the freshwater wetlands of Connecticut and Rhode Island. All are now classified as Euic at the family level. A pilot study was conducted to determine if a significant fraction of Connecticut Histosols qualified as Dystic. Fifty Carlisle pedons were described and sampled to a depth of 130 cm. The pH of each soil horizon was determined by three different methods. Each soil was sampled in the field using a Cornell Field pH Kit. In the laboratory, pH was determined in water and 0.01 M CaCl using a Accumet Model 10, Fisher Scientific meter. Samples were not dried. Of the 50 pedons sampled, 12 were classified as Dystic, 38 as Euic. Seventeen of these 38, classified as Euic by virtue of only one soil horizon having a pH of 4.5 or greater. This one horizon tended to be either the surface horizon or the bottom most horizon. Conclusions: A significant portion of soil now classified as Carlisle should be reclassified as Freetown at the series level. A study is needed to determine if significant fraction of those soils now mapped as Adrian and Palms qualify as "Dystic" and should also be reclassified at the series level. . Personnel: Harvey Luce and Debbie Frigon

**Farmer Research Groups:** Farmer Research Groups are groups of farmers, researchers, and outreach professionals who work together as collaborative partners to create, implement, and analyze experiments to solve problems of mutual interest. The size of the group usually varies from 3 to 10 farmers. The farmers decide the topics to be researched, and the researchers work as partners with the farmers to develop the research design. The farmers collect some of all of the data, and the farmers and researchers interpret the data. We currently have four research groups with established experiments. The topics of the four experiments include: 1) silage corn yields when hen manure is applied compared with yields when fertilizer is applied, 2) methods to field stack manure to minimize nutrient runoff and leaching, 3) direct-cut grass silage compared with other commonly used methods to harvest grass, and 4) evaluation of the fall soil nitrogen test for silage corn. Personnel: Thomas Morris

**Survey of the Nutrient Status of Organic Vegetable Farms:** We will survey the N and P status of a total of at least 125 organic vegetable fields across at least 18 farms in five states in the Northeast. We will measure soil nitrate concentrations and extractable P concentrations for two years. This project has been funded because of concern about the accumulation of nutrients on organic vegetable farms. Most organic vegetable producers use composts and manures to maintain the fertility and tilth of their soil. Composts and most manures are believed to slowly release a good portion of their nitrogen and phosphorus during the year of application and for a number of years after application. This slow release of nutrients is thought to provide a steady supply of nutrients for optimum crop growth. Many organic growers believe that the slow-release nature of organic amendments. especially compost, minimizes or eliminates the problem of nutrients escaping their fields in leachate or runoff. Unfortunately, preliminary results from research performed at the Rodale Research Institute and from soil samples collected from compost-amended farmer's fields suggest that only small amounts of compost can cause excessive amounts of extractable P and possibly soil nitrate. Personnel: Thomas Morris

**Nitrate Leaching in Turf Grass:** The objectives of the turfgrass science research is to evaluate the effects of different fertilizer sources, timing of fertilizer application, fertilizer rates, and clipping management on the leaching losses of nitrogen from turf used for various purposes. Anion exchange membranes and hand-held light meters are being used to determining relationships between soil available nitrate and turfgrass quality in these studies. The results from fertilization timing studies indicate that turf quality can be maintained by earlier fertilization of turfgrass in the fall than what is currently practiced, and this results in less nitrate loss to ground water. Hand-held light meters hold promise for turf quality determinations that traditionally are done. visually. Our work suggests that readings from the light meters can guide nitrogen fertilization of turf. Anion exchange membranes can predict the amount of available nitrate needed in a turfgrass system to produce maximum response without over-supplying N that is susceptible to leaching and runoff loss. The anion exchange membranes and light meters have great potential to refine nitrogen fertilization rates on turfgrass, which in turn will help to decrease water pollution concerns. Personnel: Karl Guillard

**Ion Entrapment by Soil Minerals:** Research has focused on the entrapment of ions by soil minerals. We have measured the adsorption and desorption of inorganic carbonates on goethite (a-FeOOH). We have also measured the impact of delay time between the adsorption and desorption processes on the retention of the ions by the iron mineral phase. We believe that the intraparticle microporosity of the mineral (that is, the pore spaces inside each particle) is responsible for the unusually strong entrapment of the ions, particularly if enough time has elapsed to allow the ions to migrate into these constricted areas. AS a follow up to this study, we intend to look at the impact of different intraparticle pore structures on the entrapment of ions. Toward this end, we have also identified and characterized this year different methods for the synthesis of various goethite minerals, all of which have similar chemical and crystal structures, but different microporosities (they vary in the 5 to 10 nanometer pore diameter range). Personnel: Cristian Schulthess

**University of Massachusetts**
Massachusetts Experiment Station Report
Peter L.M. Veneman
Department of Plant and Soil Sciences

Amherst, MA 01003

Several students completed their research projects and graduated this past year. Deborah Picking assessed the effect of groundwater on plant diversity in a calcareous fen in Western Massachusetts. Over relatively small distances, the chemical properties of groundwater varied considerably, resulting in distinctly different plant community assemblages. Seasonal changes were distinct, and fen characterization and classification based on a single or twice-a-year visit may yield erroneous results. Morphological and chemical soil properties varied, depending on location and groundwater characteristics. Beth Blanchet researched morphological and geochemical features of soils in a Massachusetts flood plain wetland. The site had stratified soils with silt loam textures dominating most layers. Considerable groundwater discharge occurred at locations adjacent to steep embankments. Discharge resulted in much higher iron and manganese contents than in soils with a predominantly recharge hydrology. Discharge/recharge varied over the season and depended on previous climatic conditions. While some of the soils experienced distinct discharge, at other locations discharge and recharge alternated.

Andrew Williams completed his thesis project studying the effects of long-term grassland vegetation on soil quality by comparing soil properties in adjacent soils in the Connecticut River floodplain. Soils which supported turf for periods exceeding 30 years showed greater aggregate stability and higher levels of particulate organic matter. Soil which had been tilled for decades had lower organic matter contents, and showed a considerable decline in particulate organic matter and aggregate stability. Soils which had been manured showed properties intermediate to these extremes. It appears that manure additions are not equivalent to long-term grassland in terms of soil quality.

Astrid Martinez is studying the relationship between geological formations and the occurrence of specific soil series in the Berkshires of Western Massachusetts. She completed an extensive sampling program and just finished the chemical and physical soil analyses. Spodosols in Massachusetts traditionally have been mapped at elevations above 350 m; however, it appears that bedrock type may significantly affect the distribution of spodosols. A simple parameter as elevation does not properly reflect the intricacies of soil formation and new series need to be developed for these higher elevations. Camille Nelson is studying the iron mineralogy in representative New England soils with specific emphasis on the mineralogical, chemical and morphological properties of redoximorphic features. Purpose of the study is to evaluate whether or not specific field-identifiable features reflect the hydrology of that site.

Our Natural Resources Assessment Group has almost completed the mapping of Massachusetts wetlands at a scale of 1:12,000. The results of this 5-year project are made available to the general public as a data layer in MassGIS, the Commonwealth's data management system. NRAG also completed an assessment of sub-aqueous vegetation along Rhode Island's bays and shores. We anticipate expanding that project to include all coastal wetlands in Rhode Island.

# Committee Reports

## Committee 1 Report: Research Needs
**Northeast NCSS Meeting, June 2002**
**Alexandria Bay, New York**

The 2002 Research Needs Committee Members Are:

Additional participants during committee work sessions**: Del Fanning, Andrew McDonald, Ted Trevail, Ray Bryant, Andrew Williams, and Laurie Osher**

Goals

2002 Charge(s)

2002 Accomplishments

Summary of 2002 Proposals: **preliminary texts follow and review comments are welcome*

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# Assessing P Sorption Capacity in the Northeast

**Purpose:**

**Area of Emphasis**

**Project Description:**

We propose to apply the principles of mapping to delineate soils having similar properties affecting P sorption and characterizing the resulting map units, and to develop pedotransfer functions to predict P sorption from soil properties that have been routinely measured in soil characterization studies. Knowledge of the rate of change in soil P status as affected by agricultural management is essential for predicting expected changes in water quality resulting from the continuation of traditional agricultural practices and/or the adoption of environmentally-sensitive agricultural management practices. The National P Project is collecting important data on the relationship between runoff P and soil P. This relationship varies between soils with different P sorption capacities, but P sorption capacity is not a commonly measured soil property. Studies show that P sorption capacity is specific to soil type, and broad groups of soils may have similar P sorption characteristics. Additionally, P sorption is a function of texture, mineralogy, pH and organic matter content.

**Approach** A two-pronged approach based on fundamental principles of soil survey will be used. Members of the NE Cooperative Soil Survey will work with MLRA, state, and local-level soil scientists to identify broad soil delineation's having similar surface horizons in terms of texture, mineralogy, pH, and organic matter content. Exceptional soils of significant extent will also be identified during this process. Physiographic province and state-level soil survey data (STATSGO) will be used as the base map for making delineation's of soils expected to have similar P sorption capacities. Map units and broad soil delineation's derived from existing soil survey information and expert knowledge will be sampled and characterized to provide a map of expected ranges of P sorption capacity for all soils in the Northeast. These samples will also be analyzed for particle size, mineralogy, pH and organic matter content. Cooperators will also select archived samples for inclusion in the project. Scientists at the USDA – ARS Pasture Systems and Watershed Research Unit will analyze all samples for P sorption capacity. The resulting database will be analyzed for the purpose of developing a pedotransfer function to predict P sorption capacity from knowledge of texture, mineralogy, pH and organic matter content. The pedotransfer function will refine P sorption capacity estimates derived by the mapping approach

**Expected Results and Deliverables:**

An assessment of P sorption capacities of soils of the Northeast will provide basic information needed to predict the long-term effects of agricultural nutrient management on water quality. We expect to deliver a map of P sorption capacity in soils of the Northeast and pedotransfer functions to predict P sorption capacity from texture, mineralogy, pH and organic matter content.

**Project Duration:** 3 Years

**Contacts** Ray Bryant – USDA-ARS, University Park, PA; Brian Needelman – University of Maryland; Steve Carpenter – NRCS, West Virginia; John Sencindiver – West Virginia

**Submitted by** Northeast NCSS Research Needs Committee, 2002

# Baseline Heavy Metals in the Northeast Region

**Purpose:**

**Area of Emphasis:** Northeastern states as defined by NCSS

**Project Description:** Frequently, we our customers are faced with cleaning contaminated sites and often we are asked what the natural background levels are of contaminants in the soil. However, we have very little information on the natural occurring background levels of heavy metals and other micronutrients in our soils. Therefore, we propose to coordinate a regional effort to collect data on soils for this purpose. This would include researching archived soils data and the type of analyses used to achieve these data sets. It would also require a call for data from universities and other agencies as well as requiring testing as part of the standard lab tests for classification. This project would also assist as a screening tool for other soil quality issues and in the data population set of the NASIS database.

**Expected Results:** The results of these soil investigations would be a multitude of soil descriptions and soil sampling data, thus forming a database of information to establish a model of the natural occurring background levels of heavy metals and micro-nutrients in our soils.

**Resources for Completion:** ??? Years ???

**Contacts:** Deborah Frigon, USDA, NRCS, CT; Dr. James Baker, VPI, Blacksburg, VA; Rebecca Burt and Mike Wilson, NSSL, Lincoln, NE.

**Submitted by:** Northeast NCSS Research Needs Committee, 2002

# Benchmark Soil Water Table Study

**Purpose:**

**Area of Emphasis**

**Project Description:**

This is especially true for depths greater than 100cm. Many septic tank laws and other interpretations need data to a depth much greater than needed for agricultural uses. The goal of this project is to measure water table depths for the benchmark and other important soils at their type location to a depth to be determined for each series. Data should be collected over enough time to capture five (5) or more years with "normal" precipitation. Normal precipitation is < 1 standard deviation from the 30-year average.

**Approach:** MO-12, 13 and 14 Leaders will consult with USDA-NRCS NSSC liaisons and State Soil Scientists to determine which soils will be monitored. This should include all benchmark soils and other important soils that make up extensive areas near rapidly urbanizing areas. Monitoring rain gauges and water wells will be installed at each type location or a suitable substitute. Wells will be monitored until at least 60 months of data are collected in "normal" rainfall months.

**Expected Results:** The results of this study would be average water table depths by Month for a minimum of the benchmark soils in the Northeast. Reports will be delivered to MO Leaders for inclusion in state regional and national databases.

**Resources needed:** At each site, $2,000.00 for equipment. For each NCSS university partner, $150,000 for graduate student and travel expenses

**Contacts**

**Cooperators:** State Soil Scientists, MO-12, 13 and 14 staffs, and selected NCSS university partners.

**Submitted by:** Northeast NCSS Research Needs Committee, 2002

# Carbon Sequestration in Soils of Coastal Wetlands

**Purpose:** To quantify carbon sequestration in soils of coastal wetlands and near shore environments of the northeastern US and to estimate changes in C storage in response to predicted sea-level rise and potential regional land use change scenarios

**Area of Emphasis** Northeastern United States; Maryland, Connecticut, Delaware, Maine, Massachusetts, New Hampshire, New Jersey, New York, Virginia, and Rhode Island

**Project Description:** Soils of coastal wetlands may sequester large amounts of carbon (C) under rising sea levels. However, actual measurements of C storage and well-constrained estimates of the residence time of that C are scarce. Carbon budgets in coastal wetlands and near shore environments are affected by C sequestration and respiration (and associated N volatilization and fixation), sediment erosion and retention, and loss and transgression at wetland boundaries. With rising sea levels, coastal wetlands and near shore environments may be submerged. This change in hydrologic regime may substantially influence the C stored in the soils of these ecosystems. Where sea-level rise rates exceed the accretion potential of a wetland, the wetland may be submerged resulting no net increase in C storage there. However, further inland, a new wetland may form providing additional C sequestration

**Approach** We will map the extent and spatial variability of coastal wetlands and estimate historical and future carbon changes. Data layers will be include vegetation historical and current remotely sensed imagery), soil survey, and topography (high resolution LIDAR). Field transects will be established to monitor wetland response to sea-level rise and to assess the mechanisms of C

collection will include soil morphology and characterization, soil and biomass carbon and nitrogen, detailed topography, vegetative community, and wetland loss and transgression. Historical rates of vertical accretion and basal peat ages will be determined with $^{210}Pb$ and $^{14}C$ dating. If feasible, basic processes such as C respiration and N fixation will be examined. Pedological investigations will identify seasonal, annual, and long-term trends in C sequestration. Data from field sites will be used to develop a predictive model to estimate C budgets across a range of historical and potential future sea-level rise and regional land use change scenarios.

**Expected Results and Deliverables:** We will produce a map of the current extent and variability of carbon in soils of coastal wetlands and near shore environments. We will estimate C losses and gains (vertical and lateral) under several sea-level rise and land use change scenarios. We will develop a predictive model or function to describe the nonlinear relationship between sea-level rise rates and C accumulation across variable wetland biological and pedological conditions. Field transects will become baseline data points to monitor future coastal wetland status and C budgets. This research will provide basic methodology and knowledge needed to estimate future coastal wetland C budgets on continental, hemispheric, and global scales

**Project Duration:** 5 years (**Future Funding:** Additional proposals to fund this research will be submitted to appropriate finding agencies including EPA, NOAA, selected state agencies.)

**Potential Collaborators:** Brian Needelman – University of Maryland; Mark Stolt – University of Rhode Island; Doug Miller – Penn State; Laurie Osher – University of Maine; Phil King – DE-NRCS; Peter Veneman – University of Massachusetts; John Galbraith – Virginia Tech.

**Submitted by**: Northeast NCSS Research Needs Committee, 2002

# Determining Hydric Soil Indicators in Problem Soils

**Purpose:** To address the corre4lation problems between the hydrology and the Field Indicators of specific hydric soils

**National Importance:** Since the 1600s, greater than half of the wetlands have been drained or destroyed. Over 110 million acres o wetlands have been lost and the losses continue at a rate of about 60,000 acres per year. Wetlands are vital ecosystems that function to improve water quality, control erosion and flooding, and provide unique plant and animal habitats. Preservation (or replacement) of wetlands is required by Section (404) of the Clean Water Act and the 1985 Food Security Act. State regulations apply even stricter regulations concerning filling or draining of wetlands.

The National Technical Committee for Hydric Soils (NTCHS) has written a set of field indicators that are used to identify hydric soils on agricultural land, and are used in support of the indicators in the 1987 Corps of Engineers Wetland Delineation Manual. The field indicators relate specific soil morphology with wetland hydrology. However, some hydric soils are not positively identified by the approved filed indicators. Problem soils occur in discharge wetlands, in recent deposits on floodplains, or form in red, yellow, or black parent materials. Failure to identify hydric soils in wetlands may result in misapplication of regulations and failure to prevent wetland loss. Beneficiaries of wetland protection include wetland regulators and the regulated community, and organizations that purchase, restore, and create wetlands.

Hydric soil research is being conducted in all states in the Northeast (MO-12, -13, and -14). In addition, the NRCS and both the Mid-Atlantic and New England Hydric Soils Committees have begun validating the field indicators and have identified specific problem soils. The committees are composed of representatives from federal and state agencies, universities, and the private sector.

**Approach:** 1) Produce maps of problems soil areas, 2) Select research sites, coordinated by MO leaders and NRCS personnel, 3) Solicit involvement by members of Hydric Soils Committees, 4) Install daily monitoring wells in problem hydric soils and adjacent areas of the landscape, 5) Sample soil chemistry quarterly and soil morphology annually, and 6) Validate test indicators or develop new indicators.

**Expected Results and Deliverables**: 1) Publications and reports that detail research results, 2) Modifications to the NTCHS Field Indicators of Hydric Soils publication, 3) Results provided to NRCS for inclusion in NRCS Wet Soil Monitoring database.

**Resources Needed for Completion:** A five-year study of each site will cost An estimated $200,000. Four sites will be needed for each of the six types of problem soils. Sites will be scattered throughout the Northeast to cover the range of properties. Soil analysis will be completed by the NSSL. Cooperation will be required between NRCS employees and the other principal investigators of the hydric soils committees.

**Regional Contacts:** Dr. John M. Galbraith (VPI&SU), Dr. Peter Veneman (UMass), and Dr. Martin Rabenhorst (UMD).

**Cooperators:** NRCS personnel at NSSC and NSSL, MO-12, -13, and -14 leaders, and members of the NTCHS and the Mid-Atlantic and New England Hydric Soils Committees.

**Submitted by**: Northeast NCSS Research Needs Committee, 2002

# Soil Carbon Accounting for Humods in the NE (Distribution, Extent And Properties)

Note: A poster on preliminary information for this research need is planned for Soil Science Society of America Annual Meeting in November 2002. The presentation is in Session S0515 on Wednesday, November 13, 2002 from 4:00-6:00 p m.

***Soil Carbon Accounting for Humods in Forest Landscapes of New England***
Soil carbon accounting can be improved using updated soil survey information. Frigid Humods in Northern New England may contain enough organic carbon to be reclassified in Soil Taxonomy and separated out on national soil carbon inventories. This regrouping recognizes higher estimates of potential carbon storage across the spatial extent of these series. Our objective is to combine forest soil measurement tools and modeling techniques into an integrated system to monitor the potential for carbon sequestration. Soils were sampled by visible horizon and satellite locations were sampled by 10cm depth increments to the bottom of the spodic material. Protocols for extrapolating site data to the landscape scale using laboratory characterization and field descriptions were developed. Our results are applicable to operations of farmers, private forest landowners, and State agencies and will help tailor the use of existing soil survey information. Changes induced by conservation practices on the carbon pools under forest and after cultivation can then be tracked. These new methods may lead to cost-effective and timely accounting for forest soil carbon storage at the landscape scale.

**Contacts:** Andrew Williams, Joyce Scheyer, Wayne Hoar, Steve Hundley, and Steve Gourley, (USDA-NRCS: MO-12 Amherst , MA; Lincoln, NE; SSS ME; SSS NH; SSS VT)

**Submitted by**

# Soil Surveys For Long-Term Forest Productivity Management

**Proposal**: Improving the value of soil surveys for long-term forest productivity management in the Northeastern United States.

**Area of Interest**: NE, SE (TN, KY)

**Background**: There is evidence that significant areas of forests in the northeast (PA, NY, NH, WV have existing work, other states are likely affected) are at risk for productivity decline due to soil fertility limitations. These areas are characteristically on parent materials (and thus soils) poorly buffered against "base" cation depletion and Al/Mn activity increases. Contemporary research has demonstrated the decline and subsequent improvement in red oak and sugar maple stands from Ca deficiency/Al toxicity and subsequent liming, respectively, in PA. Present soil survey information delineates soil series common to the affected areas/parent materials, but needs improvement to geographically identify high probability areas for productivity limitations and likely responsiveness to soil amendments (e.g. liming). Traditional KCl extractable Al and NH4OAC bases may not sufficiently describe series' fertility for forest interpretations, and in any case are often not well estimated. Total elemental analysis (TEA) and SrCl extraction ratios of Al and Ca are likely to be most useful for interpretive prediction of fertility limitations of mapped series.

**Approach**: Delineate the extent of the most poorly buffered parent materials of the region (Pottsville group of Pennsylvanian sediments), and particularly focus on higher precipitation portions. Inventory the existing (forest soil) data for major component series of soil map units occurring in surveys of the region. Field sample major components or reanalyze existing appropriate archive samples for SrCl extr'n, TEA, and (grain-count in most cases) mineralogy. Inventory biomass and use appropriate bulk-density methods for O and A horizons at all field sites. Cooperate with forest ecology research to further quantify soil-site-forest health and productivity-soil amendment relationships to elucidate the mechanisms of soil fertility and forest growth interaction. Explore the possibility of using multispectral scanning imagery to identify forest canopy nutrient deficiencies and/or species distributions indicative of Ca deficiency.

**Results and deliverables**: Geographic delineation of "sensitive" soil probability. Data population (and possible interp generation) in NASIS that will quantify fertility parameters in soil surveys useful to forest managers. TEA would yield side-benefit of heavy metal data for other NECSS research priorities. Merged soil and vegetation datasets that will have multiple uses (e.g. organic carbon estimation, ecological site information, soil-vegetation correlations) would be generated. Multispectral images would allow calibration of soil fertility to foliar nutrient content, or at least testing of the relationships. Further liming-response work would enable prediction of productivity cost-benefit analyses for forest managers of poorly buffered sites.

**Resources for completion**:
*Short time frame (3 yr):* Funding for 1? GS-ll staff year to inventory existing data, literature, and archived sample potential; and to set up sampling plan to supplement soil and vegetation data needs. Funding for lab analysis of approximately 60 soil profiles. Funding for multispectral images and tissue sampling/testing for a cross-section of sites.
*Longer term (15yr):* Funding to initiate and monitor liming trials and attendant sampling of soils and vegetation.

**Contacts**

**Submitted by**: Northeast NCSS Research Needs Committee, 2002

## Subaqueous Soil Investigations

**Purpose:** To further the knowledge, application, and interpretation of subaqueous soils.
**Area of Emphasis** Northeast

**Project Description:** The shallow estuarine substrate is essentially an organized, biologically active system that provides both structure and function to many important plants and animals in the estuarine ecosystem. Therefore, shallow estuarine substrates are now recognized and classified as soil. These subaqueous soils can be delineated into units with similar properties and characteristics. These delineation's are an extension of traditional soil surveys into the estuarine environment. A subaqueous soil survey would have the same implications and uses as traditional soil survey; providing a tool to manage coastal estuaries for their many uses and problems. This management tool is based on the concept that substrates serve as the foundation for many of the tangible functions and values we associate with an estuary. Although there are literally thousands of shallow estuaries in the northeast, less than a handful has any baseline soils data (data is limited to one estuary in Maryland, Delaware, and Rhode Island). Studies by Bradley and Stolt, and Demas and Rabenhorst have shown that subaqueous soils follow landscape-related, geographic location-related distributions. Understanding these subaqueous soil-landscape relationships for a broad spectrum of estuaries would provide a powerful starting point for soil scientists stepping into the shallow estuarine wetlands to document the use and interpretations of these soils and landscapes. The goal of this project is to increase our knowledge of subaqueous soil-landscape relationships for estuaries along the entire Atlantic coastline

**Approach:** Within each state representative shallow estuaries (average depth 1 to 2 meters) would be chosen to investigate subaqueous soil landscape relationships. The soils in these estuaries would be sampled in a similar fashion to traditional soil survey supported sampling for characterization purposes. Soil survey personnel would work with university representatives to choose an estuary to work on. Estuaries with recent aerial photo coverage (with excellent resolution) and/or those estuaries that have bathymetric coverage would be the focus of early studies and sampling. Typical landscapes within estuaries will be chosen for sampling and characterization (**not the entire estuary**). Transects can be set up to examine soil-landscape map unit composition and purity.

**Expected Results and Deliverables:** The results of these investigations would be a series of subaqueous pedon and map unit descriptions that would form a framework of background information to establish subaqueous soil inventories within the northeast. This information would be equivalent to the traditional block diagrams or catena approaches that are used in traditional soil surveys.

**Resources for Completion:** ??? Years - $??

**Contacts** Martin Rabenhorst – University of Maryland; Mark Stolt – University of Rhode Island; Laurie Osher – University of Maine

**Submitted by** Northeast NCSS Research Needs Committee, 2002

# Sulfide-Bearing Rock Distribution in the Northeast Region

**Project description**:
There is a need for maps showing where sulfide-bearing soil/rock materials occur within a depth of (20 m?) from the soil surface that might be disturbed in construction or mining activities. Disturbing these materials can cause the formation of active acid sulfate soils and release acid waters (the equivalent of acid mine drainage (AMD) or acid rock drainage (ARD) into drainage-ways. Model studies have been completed in MD (Valladarez M.S. thesis) on the presence and depth to sulfidic materials as related to geomorphology in Anne Arundel County, MD. In Virginia, Zenah Orndorff's dissertation on geologic formations in highway corridors with potential for setting off active acid sulfate soils if disturbed is now published.

There are 2 aspects. One is to know where such materials occur. The other is to know the depth to the materials. EPA has an interest in this subject as expressed by Dr. Dave Kargbo (EPA, Philadelphia) to Del Fanning; as a desire to have maps and a bulletin about this subject. The need for the information is shown by the many places (NJ, MD, WV, VA, PA) where active acid sulfate soils have been brought into existence by construction

# Committee 2 Report: Soil Taxonomy

NECSSC Soil Taxonomy Report

Peter L.M. Veneman, Co-Chair
Massachusetts Agricultural Experiment Station
University of Massachusetts
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***Attendants*****:** Jim Baker (Virginia Tech); John Galbraith (Virginia Tech); John Kelley (NRCS, NC); David Kinsbury (NRCS, WV); Bruce Thompson (NRCS, MA); Peter Veneman (Massachusetts). ***Members:*** Craig Ditzler, co-chair (NRCS, NE); Roy Vick (NRCS, NC).

***Goal:*** to evaluate the merits of proposals to change Soil Taxonomy.

Eighteen proposals were forwarded by Craig Ditzler, National Soil Taxonomy Leader, to the committee. The committee had one teleconference prior to the meeting. The committee members had studied the details of the proposals prior to the meeting which made for a very efficient 2-hour meeting. The committee decided to limit its deliberations to only those proposals that pertained directly to the Northeast region, unless a committee member expressed an interest in a specific proposal. The following proposals were discussed and are recommended for approval, unless indicated otherwise:
***Proposal #1*** (Add sub-aqueous subgroups) – This proposal is a direct result of changes made to the definition of 'soil' in the latest version of Soil Taxonomy recognizing sediments permanently covered with water as soil. The committee expects that once sub-aqueous soils are recognized more widely, similar subgroups in other orders will have to be incorporated as well.
***Proposal #2*** (Rename present Humic subgroups to Umbric) – This proposal rectifies a situation created by changes in earlier versions of Taxonomy. The committee was notified that the Taxonomy Committee in the Southern region was rewriting this proposal. The committee in principle supports this change, but postponed final action until the proposal has been resubmitted.
***Proposal #3*** (Exclude dense calcareous tills from Fragipan designation) – This proposal may have some impact in New York, and to a limited extent in Massachusetts and Vermont. Calcareous dense tills tend not to be as dense, to a large extent the dense character results from its mode of deposition, and they tend not to be as brittle.
***Proposal #6B*** (Spodic subgroups) – This proposal recognizes a Spodic subgroup if color of the horizon directly the Albic horizon is 1 hue darker. This proposal will affect some series that used to be classified as Spodic Udipsamments in previous Soil Taxonomy versions. The committee recommends this change be limited to Udipsamments.
***Proposal #6C*** (Hapludolls, rearrange keying sequence) – Recommended.
***Proposal #6D*** (Add Fluvaquentic subgroup to Endoaquents) – The committee voted this proposal down reasoning that what really should be proposed is an Aeric Fluventic

Endoaquent which should be inserted into the keys after the current Fluvaquentic Endoaquents. This later subgroup designation could be changed to Fluventic.
***Proposal #6E*** (New subgroup: Lamellic Oxyaquic Haplorthods) – Recommended.
***Proposal #7A*** (New subgroup: Lamellic Haplorthods) – Recommended with the notation that there is a conflict in the code assignments for proposal 6E and 7A (CDEI versus CDEJ).
***Proposal 13*** (Add new Great Group: Sulfaquerts). In principle the committee supports this proposal. However, before it is formally entered into the keys more pedon and potential distribution data need to be collected to justify this proposal.
***Proposal #15*** (Clarify 'Resistant' versus 'Weatherable') - Recommended .
***Proposal #16*** (Changes to the mineralogy keys) – Recommended.
***Proposal #18*** (Restore Mollic/Umbric criteria) – Recommended.

***Recommended Action:*** 1. to continue this committee as a standing committee of the NECSSC;
2. to recommend approval of the proposed changes to Soil Taxonomy as indicated above.

# Committee 3 Report: SSURGO/Map Finishing Committee

**Northeast Cooperative Soil Survey Conference**
**June 24-28, 2002 Alexandria Bay, New York**

**Chair:** Darlene Monds, MO-12 <Darlene.Monds@ma.usda.gov>
**Members:**
Robert F Long, Newport, VT <robert.long@vt.usda.gov>
Caryl Radatz, Missouri DU, Columbia, MO <caryl.radatz@mo.usda.gov>
Ed White, Harrisburg, PA <ewhite@pa.nrcs.usda.gov>
Lindsay Hodgman, Bangor, ME <Lindsay.Hodgman @me.usda.gov>
Cathy Keenan, Syracuse, NY <cathy.keenan@ny.usda.gov>
Mike Kortum, NCGC, Ft. Worth, TX <mkortum@ftw.nrcs.usda.gov>
Barb Alexander, Storrs, CT <barb.alexander@ct.usda.gov>
Bruce Stoneman, Virginia DU, Richmond, VA <bruce.stoneman@va.usda.gov>
Pete Whitcomb, Concord, NH <pwhitcomb@nh.nrcs.usda.gov>
Charles Delp, Summerville, WV <Charles.Delp@wv.usda.gov>
Tim Prescott, MO-13, Morgantown, WV <Timothy.Prescott@wv.usda.gov>
Debbie Anderson, MO-14, Raleigh, NC <debbie.anderson@nc.usda.gov>
James Brown, Annapolis, MD <James.Brown@md.usda.gov>
Gary Casabona, Somerset, NJ <gcasabona@nj.nrcs.usda.gov>

**Committee Charges:**

1. Clarify the current process for SSURGO rearchiving/recertification. What is required and who is responsible?

2. Clarify join requirements – what constitutes a join, personnel responsible, materials submitted, etc. Describe the process that digitizing units and MO's use to verify the join between adjacent soil survey areas.

3. Clarify how SSURGO will be maintained – when does a survey need to be recertified? What is the process for handling minor changes to the spatial data and/or tabular data for joining vs. major changes such as large areas that are remapped and recorrelated?

4. Explore possible ways to speed up the soil survey publication process, including the map finishing process.

5. Determine if there are standards in place or planned to assure that electronic soil surveys are consistent from survey to survey, much like a traditional published soil surveys. If none are planned, possibly make some recommendations regarding some minimum standards.

6. Make recommendations regarding the direction this committee should go in future conferences. Do we recommend some specific ad hoc

committees or a standing committee (not called SSURGO or Map Finishing)?

**Discussion:**

1. *Clarify the current process for SSURGO rearchiving/recertification. What is required and who is responsible?*

| | |
|---|---|
| **States:** | **Fix any errors found in your SSURGO data since certification.**<br>Edit any data that impacts CST and models used in your state.**<br>Fix the join problems - "shared" boundary is required & improve the actual soil joins if possible.<br>Run the NASIS validations<br>Perform NASIS SSURGO Version 2 download |
| MLRA Office: | Quality assurance on joins |
| Digitizing Units: | Run ssurgo amls<br>Cross reference correlation document, 37A, attribute data, & spatial data |

**** It is estimated to take approximately 2-4 weeks per survey area to edit the NASIS data. The type of data that must be edited includes: dates, sieves & rock fragments so interpretations will run, organic layers, water table, slope classes, and the population of other data needed for Customer Service Toolkit (CST) and models used in state.**

2. *Clarify join requirements – what constitutes a join, personnel responsible, materials submitted, etc. Describe the process that digitizing units and MO's use to verify the join between adjacent soil survey areas.*

As of June 2002, the NSSH Part 609.05 Maps is clear about the standards for **Progressive, Update, and Maintenance Soil Surveys - Exact Join (Just Do It!)** "An exact join occurs when two soil survey areas join lines and the joined soil polygons share the same NASIS data mapunit."

For Modern, published surveys – "The MLRA office initiates a plan for completing an exact join between soil surveys that have discrepancies with their join." ***M0-12 has determined that an "acceptable join" is the best we can do for surveys that are of the same vintage, similar scale, and same order. It is generally achieved by working within existing legends, node to node join, similar rock fragments when interpretations are affected, one named component common to both map units (if possible), and some overlap of slope classes.***

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|---|---|
| States: | ***Perform a quality join, as defined above, at the map compilation stage!***<br>Join with all surveys that will be digitized (not just the ones digitized).<br>After digitizing, do quality control on check plots provided by the |

Digitizing Unit, verifying a quality join has taken place digitally.

Digitizing Units: Perform the node to node snap, where possible.
Provide checkplots (to the state) of SSURGO certified data that joins with the survey being reviewed.

MLRA Office: After digitizing, do quality assurance on the check plots, verifying a quality join has taken place in the digital data.

3. *Clarify how SSURGO will be maintained – when does a survey need to be recertified? What is the process for handling minor changes to the spatial data and/or tabular data for joining vs. major changes such as large areas that are remapped and recorrelated*?

**Minor changes such as re-export of NASIS data for CST or Field Office Technical Guide (FOTG) or changes for joining (other than just snapping nodes) should be performed during the current recertification initiative. A small amount of funding has been provided to the Digitizing Units for this effort.**

**Perform the major changes as a result of remapping and recorrelation in consultation with the Digitizing Units. The procedure varies greatly depending on what needs to be done and the expertise the state has. If something cannot be worked out with the Digitizing Unit, call the National Soil Survey Digitizing Coordinator. The state may need to pay the Digitizing Unit for assistance.**

4. *Explore possible ways to speed up the soil survey publication process, including the map finishing process.*

**If the data utilized in map finishing is good (no coincident features, features align with publication imagery, and joining has been performed) then the map finishing process is straight-forward. It will take about 2 to 3 months for an eastern soil survey.**

**so that the English edit and the Digital Map Finishing (DMF) process occurs concurrently. The technical edits performed by the states are currently backlogged.**

**Accurate map compilation and thorough quality control are the basis for a smooth map finishing process:**

**A. Plan, plan, plan – decide what features will be published and compile or acquire the hydro, roads, and town boundaries during map compilation.**
**B. The map compilation needs to be performed by or closely supervised by a soil scientist [a good compiler] knowledgeable of the digital technologies.**

**C. Thorough quality control of the "ssurgo"and the map finishing features concurrently will find problems at the compilation stage, rather than at the map finishing stage.**

*5. Determine if there are standards in place or planned to assure that electronic soil surveys are consistent from survey to survey, much like a traditional published soil surveys. If none are planned, possibly make some recommendations regarding some minimum standards.*

Currently, there are many different soil survey products being developed on CD and web-based. Formats include pdf, html, or a combination of both, some with hyperlinking. There are three basic products to date:

- Entire soil survey publication scanned as an historical document
- Manuscipt scanned but tables generated from NASIS (some editing of scanned manuscipt necessary to match NASIS data) + digitally map finished ssurgo maps with digital ortho imagery.
- Unpublished surveys - English edited manuscript + digitally map finished ssurgo maps with digital ortho imagery. This is the same product that is sent to the Government Printing Office for hardcopy production.

Because of the consistency of our traditional published soil surveys, users familiar with the publications could easily locate soils information anywhere in the country. The consistency is being lost as we "customize" the electronic soil surveys, thus making it more difficult for some customers to utilize the information from survey to survey and state to state. Some electronic products require software such as Acrobat Reader and/or Internet Browser software. NHQ is currently encouraging innovation. However, our group would like to see some basic <u>minimum</u> standard such as English edited manuscript and digitally map finished maps for surveys that are unpublished.

*6. Make recommendations regarding the direction this committee should go in future conferences. Do we recommend some specific ad hoc committees or a standing committee (not called SSURGO or Map Finishing)?*

**There is a need for sharing technology information, which this committee cannot effectively achieve since we meet only once every two years. It was decided that the work of this committee has ended.**

**Recommendations:**

1. Although NHQ is currently encouraging innovation with regards to electronic soil survey, some basic <u>minimum</u> standard is needed to assure that soil surveys look similar from survey area to survey area.
2. The group does recommend that some regional NRCS contact, possibly via the Interdisciplinary Resource Team (IRT), be established to monitor technology that

potentially could be used in soil survey.  Further, this person could forward links to the information to state soil scientists, MLRA team leaders, and NECSS universities.

# Committee 4 Report: Site Specific Soil Mapping

*Year 2002*
*Northeast Cooperative Soil Survey Workplanning Conference*
*June 24-28, 2002*

*Alexandria Bay, NY*

## Site-Specific/Order 1 Soil Mapping Standards Committee

Committee Members

Pre-Conference 2002 Conference

## Committee Goal

**Committee Charge #1:**
**Formalize guidelines for the Northeast. How do these guidelines compare with those of the National Society of Consulting Soil Scientists?**

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**<u>Recommendation #1</u>**

**This committee recommends the NRCS Soil Survey Division continue to encourage efforts by State Soil Scientists in the development of Order 1 /Site-Specific soil mapping standards when an identified local need exists.**

**Committee Charge #2:**

**Is there is a boundary between Order 1 soil surveys and Site-Specific investigations?**

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**( Map recognized series, use accepted NCSS terminology, accepted protocols for describing soils)**

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**<u>Recommendation #2</u>**

**The NCSS should recognize both Order 1 and Site-Specific mapping as separate and distinct mapping protocols.**

**Cooperative efforts should be established to define Order 1 and Site-Specific in terms of the scope of soil map products allowed under NCSS guidelines.**

**Committee Chair has volunteered to work with the NSSC staff with the update of the Soil Survey Manual.**

**Committee Charge #3:**

**What needs do consulting soil scientists and university soil scientists have with respect to interpretations of site-specific/high intensity soil mapping?**

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**Recommendation #3**

**The Soil Survey Division should encourage states to increase cooperative efforts with the Private sector in providing workshops, training and other educational opportunities pertaining to the National Cooperative Soil Survey.**

**Committee Charge #4:**

**What are the Technical Soil Services needs associated with Order 1/ Site Specific mapping?**

- **Consultants**
- **Universities**
- **State and local governmental agencies that are adopting these standards**
- **Third Party Vendors**

- **Training as previously identified**
- **Updates on changes in NSH, OSD's**
- **Participation in field reviews**

- **Support of Farm Bill Programs**

- **Provide Site-Specific investigations for EQIP practices**
- **Proper siting and design of Ag Waste systems**
- **Mapping leachate plumbs; extent and direction of surface contamination**
- **Identify leaking, or flawed containment facilities**
- **Reduce the likelihood of errors and omissions (very costly)**

- **Support for Nutrient Management Plans**
- **Phosphorus loading; Nitrate leaching**

❧

- **Site-Specific mapping to support habitat maps used for ecosystem restoration.**

❧

- **Identify wetland boundary**
- **Easement boundary; where to separate cropped from non-cropped areas.**

**<u>Recommendation #4</u>**

**Cooperative efforts should be established to assess the latest technology in field tools to help develop Order 1 and/or Site-Specific soil surveys. There should be a listing of who has these tools and to what extent they can be shared.**

**<u>Recommendation #5</u>**

**The Soil Survey Division should support efforts to strengthen the validity and use of Order 1 /Site Specific mapping to support Farm Bill programs.**

**The Soil Survey Division should support efforts to strengthen the validity and use of Order 1 /Site Specific mapping to support Farm Bill programs.**

**Recommendation #6**

**It is recommended Technical Committee #4 on Site-Specific Soil Survey be terminated and this topic placed as a charge to the Committee on Technical Soil Services.**

**Charge: "Identify the value of, and the resources needed to provide Order 1/Specific mapping standards and map products to both external and internal customers".**

Site-Specific Soil Survey/High Intensity Soil Survey/NCSS Standards
Summary of Recommendations

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# Committee 5 Report: Hydric Soils

## Current Activities of the Mid-Atlantic Committee for Hydric Soils

Current Members: Skip Bell, Leander Brown, Steve Carlisle, Jake Eckenrode, John Galbraith, Jim Gregory, Rick Hertges, Christopher Jones, R. Harold Jones, Phillip King, Al Rizzo, Carl Robinette, Dan Schinder, Ralph Spagnolo, Ed Stein, Ronnie Taylor, Maryann Thiesing, Jeff Thompson, Lenore Vasilas, and Bruce Vasilas

The purpose of the Mid-Atlantic Committee for Hydric Soils (MACHS) is to provide technical and regulatory assistance to wetland professionals. The committee does this by identifying research needs, collecting information, providing assistance, and formulating recommendations for the better understanding of hydric soils in the Mid-Atlantic region.

Committee members include representation from the Natural Resources Conservation Service, US Fish and Wildlife Service, New jersey Department of Environmental Protection, US Environmental Protection Agency, Maryland Department of the Environment, University of Maryland, University of Delaware, Virginia Polytechnic Institute, and North Carolina State University. States represented include New York, New Jersey, Pennsylvania, West Virginia, Delaware, Maryland, Virginia, and North Carolina. Meetings are held twice a year, usually in January and June, and are usually located in a place where the committee can visit a site exhibiting problems with hydric soil identification.

Products that have resulted from the work of committee members include the publication *Field Indicators of Hydric Soils in the Mid-Atlantic United States*, a field guide that represents the field indicators for the Mid-Atlantic land resource regions listed in the National Technical Committee for Hydric Soils (NTCHS) publication *Field Indicators of Hydric Soils in the United States*. The publication includes sections for each land resource region found in the Mid-Atlantic as well as diagrams depicting each indicator. This publication is currently out of print, but can be downloaded from the MACHS website at www.epa.gov/reg3esd1/hydricsoils/index.htm. The field guide is currently being updated to version 5.0 of the NTCHS publication and it is hoped that the publication will be available by January 2003. The new field guide will also contain local user notes, including helpful hints applicable to the Mid-Atlantic region as well as local geologic terminology.

The committee is also working on the publication *Guide to Hydric Soils in the Mid-Atlantic United States*. This publication is being written for an audience of young soil scientist and wetland scientists. It is based on the publication *Hydric Soils of Florida Handbook*. Chapters are being written and edited by members of the MACHS. Chapters topics includes pedogenesis of hydric soils, hydric soils and regulation, describing hydric soils, hydric soils and wetland landscapes, hydric soils and wetland function, and soils and wetland mitigation as well as many others. Although we currently are not sure how this will be published, we hope to finish the document by January 2003.

Research being conducted on hydric soils in the Mid-Atlantic by members of the committee include a red parent material study, a study of hydric soils in Piedmont slope wetlands and flood plains adjacent to the slope wetland, Anomalous Bright Loamy Soils (yellow soils in wetlands adjacent to tidal areas), and Ectomycorrhizal fungi as indicators of the absence of wetland hydrology. The committee is also considering a study of glauconitic soils after a field trip in January showed that upland glauconitic soils can meet the field indicator F6. Redox Dark Surface. Most of these studies are funded at least in part by EPA Region 3. For mor information on MACHS research go to their website at www.epa.gov/reg3esd1/hydricsoils/index.htm.

The MACHS co-sponsored a National Hydric Soils Workshop in March of 2001. The workshop included a day of basic hydric soils training, a day of presentations on current hydric soils research, and a day in the field looking at hydric soils in the pine barrens. The workshop was very successful with 300 people in attendance for the first 2 days and 150 people in attendance for the field trip. Preparation for the field trip, many of the presentations, and guidance during the field trip were mainly provided by members of the MACHS and the NTCHS.

The committee also assists local soil and wetland scientists with potential problems with the use of the NTCHS fi( Moses ind)5(i)-2t(soils with )]TJ6.0003 Tc -.0001 T2 17.825 0 *(s ind)5(d[-a)5( Mi
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thought the soil was hydric or in the case of the upland soils with thick organic surfaces the organic matter was too red to meet the color criteria for black histic. A concern was brought up about these soils with thick organic surfaces classifying out as Andisols instead of folists. The one problem we did encounter was at our last site visit on White Face Mountain. The soils appeared to be on an upland landscape position, however, the soils met the indicator S1. Sandy Mucky Mineral. The MACHS had provided enough information to the NTCHS to eliminate F1. Loamy Mucky Mineral from use in land resource region R, however, S1. Sandy Mucky Mineral has not been eliminated from use. A potential joint project between the MACHS and the New England Hydric Soils Committee may be to collect data to determine if S1 needs to be eliminated from this land resource region.

The second day of the meeting many of the people on the committee who attended the field trip disbursed to other committees they were on. The Hydric Soils Committee met with 5 people. They were, Wayne Hoar, Lenore Vasilas, Bruce Vasilas, David Marceau, and Andrew McDonald. Leander Brown joined us toward the end of the meeting. After Wayne Hoar and Lenore Vasilas gave a brief overview of what the two regional committees are doing, a discussion was had about growing season and the NTCHS technical standard. Some of the attendees at the meeting were unfamiliar with the technical standard and it was decided that a better effort needs to be made to disseminate information from the NTCHS to the local committees and the public. Potential collaborative efforts on research projects was also discussed. Some of the topics included possibly getting Connecticut some funding or equipment to add another site to the MACHS red parent material study, developing maps of the Northeast to identify areas of potential problem soils such as high elevation organic soils and red parent material, and a compilation of water table data collected for soil survey projects throughout the Northeast. New England is also interested in looking more closely at disturbed soils, while the Mid-Atlantic’s biggest problem is identification of drained hydric soils.

# Committee 6 Report: Subaqueous Soils

**Subaqueous Soils Committee - Northeast Soil Survey Work Planning Conference**
Minutes - Tueday June 25, 2002
Meeting convened 8:05am
Committee members present: Marty Rabenhorst, Phil King, Jim Brown, Steve Carlisle, Lauri Osher, Mark Stolt.
Others present: Wade Hurt, William Taylor, Maxine Levin, Kip Kolesinskas

**Charges 1 & 2**

1. **Develop and describe a general strategy or protocol for conducting a subaqueous soil survey which addresses the difficulties and problems unique to these areas and which could serve as an introduction and guide to those considering or beginning subaqueous soil survey work, including:**
   a. **Approaches to subaqueous terrain analysis**
   b. **Approaches to soil sampling and analysis in subaqueous settings**
   c. **Subaqueous soil landscape models**

2. **Develop a list of resources available for addressing the unique situations and problems associated with conducting subaqueous soil survey, including:**
   a. **accessing and obtaining available bathymetry**
   b. **collecting bathymetric data**
   c. **analyzing bathymetric data for terrain analysis**

Discussion:
Marty Rabenhorst explained that a draft document was being prepared outlining a strategy/protocol for conducting a subaqueous soil survey. This will be based on experiences of those involved in subaqueous soil survey. This is intended to be a resource for those interested in initiating a subaqueous soil survey. Written input was received from Laurie Osher that will be incorporated. Others suggested inclusion of estimates of such things as mapping rates, number of days per week which are likely to be able to be spent in the field, etc. Within a few weeks, a draft will be circulated to the committee for review and comment.

The idea was suggested by Maxine Levin, and supported by others, that we sponsor and organize an informational meeting to facilitate communication and collaboration with other federal, state and local agencies (for example to compare NOAA benthic mapping with NRCS subaqueous soil mapping). It is anticipated that this meeting would help give us an opportunity to explain the strengths and benefits of using our pedological approach to mapping subaqueous substrates. Specific federal agencies to be targeted will include (but not be restricted to) USGS, USACE, EPA, and NOAA. We want to target those who are the national, regional and local leaders in estuary/ecosystem management. It was the consensus of the committee that the meeting should be one day in length, and should be held in early winter (January or February) and preferably at the NOAA headquarters building in Silver Spring, MD. Maxine Levin agreed to coordinate and organize the meeting. Committee members agreed to provide her with names of potential contacts at various agencies, and possible topics and titles for papers. Maxine will develop a draft outline for the program and circulate this to the committee for input. A suggested title for the meeting is “Habitat Assessment for Management and Restoration of Estuarine Environments: Focus on Substrate”

The committee also decided that a workshop should be held next summer to provide an opportunity for soil scientists in the NCSS to gain experience in subaqueous soil survey. This workshop was envisioned to be several (3-5) days in length and would include both classroom and field components. Tentative dates for the workshop were set for June 23-27, 2003. Classroom topics would include: an overview of coastal processes; an overview of soil/horizonation/descriptions/taxonomy for subaqueous soils (with cores available in the classroom); benthic ecology/interpretations; terrain analysis; sampling and sample handling; processes of subaqueous soil formation. Field activities would be held in the afternoons and would include: acquisition of bathymetric data; sampling using bucket auger, MacCaulay sampler, and vibracorer. A draft agenda will be developed by Mark Stolt and Marty Rabenhorst. Although a location was not selected, it was thought that the Delaware Inland Bays or the Maryland Coastal Bays would be a good location. If the workshop is repeated in subsequent years, alternate locations could be used.

**Charge 3. Compile a list of preferred terms and definitions to be used in describing subaqueous soil landscapes and special subaqueous soil features**
Discussion:
Mark Stolt wrote a draft glossary of soil geomorphological terms pertinent to subaqeous systems and landscapes that was circulated among the committee. Some feedback has been received from Phil King and Phil Schoeneberger, and revisions are underway. A revised glossary will be circulated to the committee for review and further comment. Care will be taken to try to ensure that terms are as consistent as possible with terms in the *Glossary of landforms and geologic materials* (Part 629, National Soil Survey Handbook).

**Charge 4. Consider possible proposed changes to *Soil Taxonomy* regarding inclusion of or accommodating subaqueous soils.**
Discussion:
The committee discussed the possibility of recognizing subaqueous soils at the subgroup, suborder and order level. It was reported that the Soil Taxonomy Committee had approved the pending proposal to recognize these soils at the subgroup level. Several people thought that the significance of subaqueous soils was such that eventually they would be recognized in a separate order (Aquisols for example). However, people seemed comfortable with their current recognition at the subgroup level until such time that sufficient information and documentation is collected to warrant the initiation of a committee to study the formation of a new soil order.

**Charge 5. Compile a list of possible soil interpretations to be developed for subaqueous soils**
Discussion:

It was generally recognized that interpretations

# Committee 7 Report: Technical Soil Services

**Technical Soil Services Committee 7 Report**

**Technical Soil Services ad hoc committee report.**
**Northeast Cooperative Soil Survey Conference, June, 2002**

**Background:**

This Ad Hoc committee was proposed by the East Region Technical Soil Services Network made up of State Soil Scientists and New England NRCS soil scientists involved in technical soil services delivery. This group shares information predominately through email and teleconferences.

**The Charge:**

Establish effective communication among technical soil service providers and others to maintain consistency, reduce duplication, and improve technical soil services in the east region.

## The Members

Lisa Krall, NEIRT
Thom Villars, VT
Jim Turenne, MA
William Taylor, MA
John Davis, MAIRT
Shawn McVey, CT
Ed Stein, NY
Chris Smith, NJ

**These are the issues we brought for discussion at the June meeting:**

- Promote consistency and suitability of soils criteria in standards and specifications
- Develop a means of communicating
- Regional meeting of soil tech. services providers.
- Bring technical soil services to the level of the agency's other services.
- Address research and data collection needed for technical service delivery.
- Pull people together to work on problems
- Address training needs:
- Address Non-standard interpretations (Urban soils interpretations, etc.)
- Soil information in field offices. (What is needed? How to provide it.)
- Address problem national interpretations.
- Develop a self-service information capability for public on easy and/or

common questions. If on a website, committee could write up common scenarios and thus sort of explain the ratings with examples.

- On-sites investigations:

When are they "technical soil services" (NSSH, Part 655) and when are they "limited revisions of a soil survey" (NSSH, Part 610)? (It seems that some folks at the national level feel that on-sites are covered under Part 610. )

Do on-sites affect the "official copy of the soil survey?"

- Prime farmland and other important farmland determinations: when do we get involved and when do we refer these requests to the private sector? Are prime farmland ratings map unit-based or component-based? What scale is appropriate to do important farmland on-sites?

**Many people joined us for a portion of the two break-out sessions. The second session was held jointly with the Site Specific Mapping Committee to discuss common issues. Many thanks to all of those who stopped in to share their perspectives.**

**Six focus areas surfaced during our discussions.**
**They are:**

1). **Communications! In all directions.** This includes between soil resource specialists and state, regional, and field offices, university, private sector, NCSSC, SSD, as well as among soil resource specialists.

- ex. The new *e*fotg, heads up needed for soil resource specialists on workload, training, timelines, etc. in order for them to implement section 2.

- ex. Sharing of products among Soil Resource Specialists such as generic presentations, fact sheets, etc. that could be localized for use by others. This could include Powerpoint presentations for use as “just in time” training to update resource soil scientists with technology/methodology.

2). **Address problem interpretations.**

**Identify**

- problems with national interpretations
- nationwide issues with criteria used to develop interpretation
- region specific issues with interpretations
- state data issues

**Prioritize**

**Seek resolution**

3) **Coordinate the establishment of a minimum skill set and level**

**Address training needs**
Technical and "people" skills

**Recommend basic qualifications for the soil resource specialist position**.

4) **Identify research and data collection needed for technical service delivery. Communicate with research needs committee.**
Ex. Many requests come in for background levels of metals in our soils. Testing is needed. The research needs committee has this on their project list. Soil technical services group should ad input, possible assistance if appropriate (sample collection, perhaps)

5) **Market Technical Soil Services and National Cooperative Soil Survey**.
Ex. Identify Technical Soil Services required by the new Farm Bill. Work with Site Specific Mapping committee to provide a white paper for the National State Soil Scientists Meeting this October.

6) **Needed: Guidelines for soil resources specialist performing:**

**On-site evaluations**
**High intensity soil surveys**
**Single use soil surveys**
**Corrections to official soil survey**
**Documentation / archiving of additions to the soil survey**

Explore available guidelines in NCSS handbooks and manuals first to see what we already have.

The site specific mapping committee decide to disband after the conference. They will work with us on this and other issues of interest to them (NASIS, training, tools).

## Technical Presentations

## New Innovations in Soil Survey Publications

National Cartography & Geospatial Center
Major Emphasis FY2002

- **ESRI-Authorized Learning Center**
- **3 ESRI-Authorized Trainers at NCGC**
- **Geodata Refreshed ???**
- **Announce NRCS Gateway Delivery Point**
- **Partnership with FSA-APFO**
- **NRI & Soils Support**
- **GIS Helpdesk Support**
- **Minimizing Security Risks**
- **USDA GPS Contract Support and Training**
- **FGDC Clearinghouse**
- **Pilot and Implement Geospatial Data Warehouse/Gateway**
- **GeoData Replication**
- **GPS, Dig. Camera, PDA, Mobile Comp.**
- **Remote Sensing Support to NRCS**

NCGC provides technical leadership for NRCS in …

- **Cartography**
- **Remote Sensing**
- **NRI Support**
- **Global Positioning Systems (GPS)**
- **Geographic Information Systems (GIS)**
- **Soil Survey Support**
- **Archiving of Information**
- **Technical Publication Edits and Reviews**
- **Training Team**

Status of Soil Survey Mapping and Publications

- **Mapping/updating:**
  - **Mapping/updating about 24.6 million acres a year (last 8-year average)**
  - **Refresh rate of once every 94 years.**
- **Publishing**
  - **Publishing about 45 surveys per year (average in the 90's),**
  - **Refresh rate of about once every 73 years**
  - **Many of our published products are out of print.**

Improvements to the Process

- **Reduce the number of hard copies printed for each survey and supplement with CDs or other electronic media**
  - **Current average is around 1500 copies**
  - **Reduce to 500 copies and 1000-2000 CDs**
  - **Significantly reduces cost of printing allowing for more soil survey areas to be printed**

## Improvements to the Process

- **Automate as many of the publication processes as possible**
  - **Digital Map Finishing**
  - **General Soil Maps**
  - **Soil Survey Manuscripts**
- **NSH cites STATSGO as base for GSM**
- **93 products pending at NCGC, 2 are STATSGO based**
- **GSMs are averaging 80+ staff hours to process to the point of making a negative ready to send to printer**

## General Soil Map – Traditional

- **General Soils Map – Digital (non-SSURGO)**
- **GENERAL SOILS MAP – SSURGO**

## Soil Surveys on CDs and other media

- **CD Summit and report**
- **Multiple formats available**

  **Pdf example -- new**
  **Html example**
  **GIS_ArcExplorer example**
  **Adobe.pdf example --historical**
  **GIS_SOILView example**

## Publications

- **Generally speaking, IF the soils information is ready to put onto CD-ROM for distribution, it is ready to be sent for hard copy publication.**
- **Some of the issues to consider:**
  - **What constitutes an "official" soil survey?**
  - **If CD releases supplement the hard copy, can they be different from the hard copy, i.e.. Other thematic maps.**

## New Innovations and Products

- **DMF issues**
- **Resource Data Gateway and Soils Data Warehouse**
- **New GIS tools**

Soil Landscape Visualization with ArcScene
Example of Navigation
Example of Navigation
Slope Range Shapefile
Quantification of Slope Inclusions

# Use of Soil Survey in Environmental Modeling

**presented by Steve DeGloria, Cornell University**

**Stephen D. DeGloria**

**Northeast Cooperative Soil Survey Conference**
**Alexandria Bay, New York**

**Farm and Watershed Nutrient Management**
**Sediment, Nutrient, & Pesticide Fate and Transport**
**Ecological Land Classification and Survey**
**Habitat Modeling and Biodiversity Conservation**
**Soil Information & Decision Support Systems**
**Soil Survey Technical Support Services (SISL)**

- Establish soil survey as cornerstone of environmental science and land grant mission of university.

- Expand capacity to meet demand for soil survey information which is greater than ability to supply it.

- Define a complementary soil survey program with counterparts in NE region.

- Advance information science and spatial decision support systems to provide framework for program.

Clarification of roles and responsibilities of NRCS soil survey staff and university soil survey programs.

Definition of best mechanisms for interacting with and gaining assistance from NRCS soil survey staff.

Integration responsibilities for project areas requiring multiple soil surveys of variable quality.

Soil Biology
Offer in process; 7/03 start (R,T)

Crop Molecular Biology
Request to advertise pending; 7/03 start (?) (R,T)

Soil and Landscape Information Systems

Planning phase; Request to advertise 7/03; 7/04 start (E,R,T)

Soil Biogeochemistry/Biocomplexity

Planning phase; 7/04 target (R,T)

**Cornell committed to supporting soil survey program but relationship to college priorities must be explicit.**

**Need feedback from soil survey programs at other institutions to define a complementary program at Cornell.**

**Need to resolve and update roles and responsibilities between NRCS- and university-based soil survey programs.**

**Classification and Interpretation of Urban Soils**
**(Soils in Urban Areas)**
***Northeast NCSS, Alexandria Bay, NY 2002***

## Concepts in Urban Soils

## Urban Links to Other Interpretations

## Urban Research and Development

## Methods in Urban Soil Survey

## Approaches to Urban Map Unit Design

*City of Baltimore Soil Survey (1987-89 mapping)* - *Maxine Levin*

*District of Columbia Soil Survey (1976 mapping)* - *Horace Smith*

•

– **(> 85%, 40%, 5%, <5%)**

•

– **(<10%, 20%, 25%, >15%)**

•

– **(<5%, 40%, 70%, 80%)**

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*New York City ( 3 surveys 1996-2001)* - *Luis Hernandez and John Galbraith*

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## Information available from ICOMANTH:
## International Committee for Anthropogenic Soils
****contact: Dr. John Galbraith, chair***

## Product Developed By A State

## Networks for Urban Soil Survey

## Continuing Projects in Urban Soils

## Selected Photos from Tours and Exhibits Involving Urban Soils

## Take - Home Thoughts

## Automated Compilation and Digitizing using Orthorectification

Presented by **Steve Gourley, State Soil Scientist, VT**

- Showed power-point
- Tested on a 48,000 acre tract in Windsor County that was compiled by conventional methods
- Produced a more accurate product using orthrectification and onscreen digitizing
- Eliminated a lot errors that a created by manual compilation
- Endorsed by the MO-12 staff and the DU in Madison
- Typical survey – digitized product
- Conventional method – 1200 hours, $19,000 cash outlay
- Orthorectification – 1730 hours, $375 cash outlay
- Time for orthorectification should decrease with the high end machines that we picked up this year

# The NRCS Soil Quality Institute and Dynamic Soil Properties

A presentation made at the Northeast Cooperative Soil Survey Conference,
Alexandria Bay, NY. June 25, 2002.

Ann Lewandowski, 612-624-6765, alewand@soils.umn.edu

## Preface: What is soil quality?

"Soil Quality" has been a buzz word for several years and has come into common usage, but there is not universal agreement on what it means. At the Soil Quality Institute, we focus on two key components of "soil quality": soil functions and management-induced soil changes.

Soil quality is the capacity of a particular soil to function. The major functions of soil are to:

- Sustain biodiversity and productivity;
- Regulate and partition the flow of water and solutes;
- Cycle and store nutrients;
- Filter, buffer, degrade, immobilize and detoxify organic, inorganic, natural, and anthropogenic compounds;
- Provide structural support for roads, buildings, landfills, and archaeological treasures.

Individual functions should not be considered in isolation nor only over the short term. In other words, resilience, resistance to change, and sustainability are essential components of soil quality. I want to stress that soil quality should be defined by how well soil functions, not by a set of soil characteristics, such as OM levels, soil aggregation, pH, etc. These characteristics are used as proxy measures to assess soil quality, but they are not the ultimate goal. Our ultimate interest is in how soil performs the functions listed above.

The second key concept of the definition of soil quality is that soil changes in response to management, climate and other drivers on the scale of years and decades. In some cases, those changes are permanent and have triggered debate about the taxonomic classification of soils. More often, the changes are reversible and we can manage soil in such a way that function either improves and declines.

Soil function changes with management, but soil function must be assessed in the context of the soil's inherent characteristics. In this way, soil quality becomes a link between the soil survey program and technical assistance.

## SQI activities

All of our projects are cooperative efforts involving a variety of critical partners including NRCS field offices, the research community, and local, state, and federal agencies and conservation organizations. The activities of the Soil Quality Institute can be divided into the following three categories.

#### Soil assessment

We help develop science-based tools and guidelines for assessing, inventorying, and monitoring soil quality at different geographic scales. One example of this work is the Soil Quality Index. The Index transforms and integrates soil quality indicators of a Minimum Data Set into one or several values that represent soil quality. There are a variety of possible indexing methodologies that have been developed although there is not yet a consensus on indexing methodology. Generally, soil quality indexing involves three main steps: (1) choosing appropriate indicators for a minimum data set (MDS); (2) transforming or standardizing indicator scores; and (3) combining the indicator scores into the index (Andrews et al., 2000). Soil quality indicators should be selected according to the soil functions of interest and the defined management goals for the system.

The Soil Quality Index is a research and validation tool – not a field tool. SQI projects support three legs of a stool:

- National programs, policy and performance measures
- Field tools (e.g. Soil Conditioning Index)
- Research tools (e.g. SQ Index) which provide science-based validation for the other two legs.

### Soil management

We help identify viable resource management approaches that improve or maintain soil quality on farms, ranches, forests, and other lands.

### Education and customer service

All our projects lead to training or informational materials accessible for our diverse customers. The foundation of our training is the field course, "Soil Quality-Assessment and Applications for Field Staff." During Fiscal Year '02 alone, we will have presented the course nine times in New York, Nebraska, Louisiana, Tennessee, Washington, Iowa, Hawaii, Kansas, and Texas.

Recent soil quality products include:

- Rangeland Soil Quality Information Sheets to complement the original cropland-oriented Soil Quality Information Sheets.
- Soil Quality Posters
- Soil Health Cards (newest developed by Margie Faber and others in Connecticut.)
- SQI brochure

All Soil Quality Institute products are available at our web site at: www.statlab.iastate.edu/survey/SQI. This address will soon change to soils.usda.gov/sqi

### Farm Bill and Soil Quality

The Farm Security and Rural Investment Act of 2002 includes two Titles relevant to soil quality: Title II – Conservation, and Title IX – Energy.

For more information about the Farm Bill see the NRCS web site at: www.nrcs.usda.gov

Nothing in the Farm Bill has changed our basic conservation message which is to support systems that promote soil, water, and air quality. These systems include those that

- Increase soil organic matter
- Reduce tillage
- Increase plant diversity
- Grazing management
- Nutrient management

Three items of interest:

1. With this and the last Farm Bill, the primary conservation tools have shifted away from idling land (e.g. CRP, WRP), and towards conservation on working lands (EQIP, WHIP, CSP).
2. The tier system of conservation (Conservation Security Program) is a new approach. Farmers will be given per acre support based on the level of conservation practices they are applying. **The Soil Conditioning Index can help support the application of this program.** Briefly, the three tiers are:
   1 = one practice applied on a minimum acreage
   2 = one practice applied on the whole farm
   3 = total resource system on the whole farm
3. Third-Party Technical Assistance will become more common. The Secretary is directed, at the option of the producer, to provide a payment to the producer for procuring technical assistance from a non-USDA third party. All third-party providers must be certified by USDA. We want to ensure that knowledge of soil quality will be part of the certification process.

**The Energy Title** is relevant to soil quality because it concerns mitigating energy-related $CO_2$ emissions (e.g. sequestering carbon in soil) and promoting alternative fuels (e.g. biofuels and other plant-based sources of energy). The title mainly funds research.

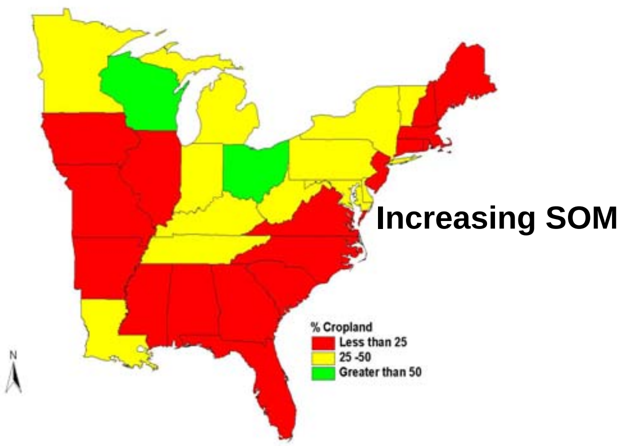
The Soil Quality Institute has helped evaluate and test methods for monitoring carbon, including Laser Induced Breakdown Spectroscopy (LIBS) which allows rapid assessment of soil carbon levels. We are also helping to validate & improve models to assess carbon, including EPIC, Century, and the Soil Conditioning Index.

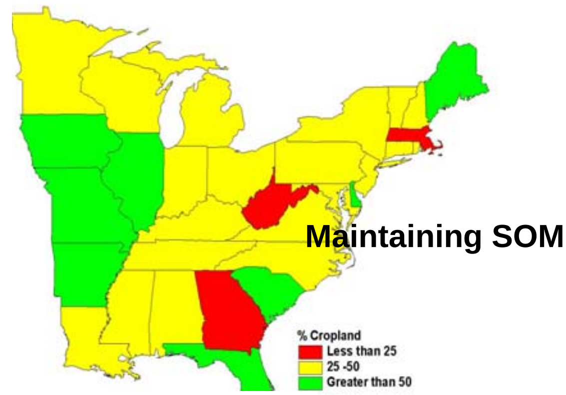
We are concerned about the growing interest in using crop residues for biofuels or co-generation of energy. It is important to determine how much residue can be harvested and how much must be left behind to maintain erosion control and improve soil quality. Soil quality is more than erosion control, so leaving only enough residue to keep erosion below “T” may lead to a decline in soil quality.

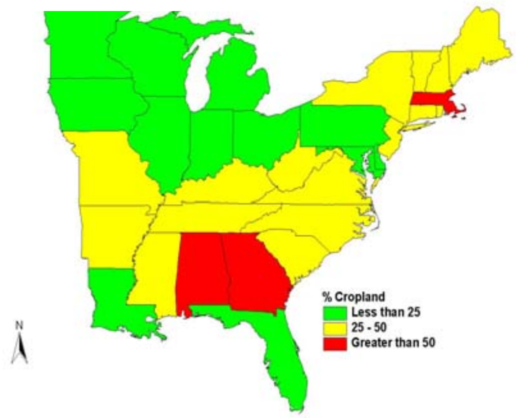
### Soil Conditioning Index

The Soil Conditioning Index (SCI) is a Windows based model that can predict the consequences of cropping systems and tillage practices on the status of soil organic matter in a field. The Soil Conditioning Index has three main components including the amount of organic material returned to, or removed from the soil; the effects of tillage and field operations on organic matter decomposition; and the effect of predicted soil erosion associated with the management system. The SCI indicates whether the current system will trend towards increasing, decreasing, or maintaining soil organic matter levels. This is not an indicator of soil quality as a whole, although soil organic matter status is an important indicator of soil quality. The SCI should not be used to predict absolute amounts of C, or rate of change.

The SCI can be used as a field office tool to support conservation planning and interact with the landowner in the decision making process. The SCI can also be used at a regional scale as a performance measure. The following maps give an example of using NRI data with the SCI to predict SOM trends at the state level.




SCI will soon be linked to RUSLE. The most recent version of the SCI is available at: ftp://ftp.nssc.nrcs.usda.gov/pub/agronomy/SCIfiles/latest_revisions

## Dynamic Soil Properties Information

There are two ways to view the quality of soils. Inherent soil quality results from natural soil forming processes and factors, and dynamic soil quality results from changes due to human use and management. (SQI focuses on the dynamic soil quality, but they are really inseparable.)

We have an extensive database of information about inherent soil quality, but far less information about how soil properties change with use and management on specific soils. It is easy to show that soil properties (e.g. soil organic matter and hydraulic conductivity) vary with land use, but to gather such information systematically will be a huge undertaking. So we need to quantify the economic value of having this information.

The value of dynamic soil properties can be quantified in numerous ways. For example, if the water relations in a soil changed enough to justify changing the hydrologic soil group, this would affect the estimation of the necessary size of a water catchment structure to treat runoff. The consequences of making the structure too large is excess cost; the consequences of making it too small is early structural failure. This and two other examples of how to quantify the value of dynamic soil properties information are further developed in a Dynamic Soil Properties Information Problem Statement available from alewand@soils.umn.edu.

Some terms related to dynamic soil properties include:

**Dynamic soil properties**: Soil properties that change with use, management, natural disturbances, and natural cycles (e.g. seasonal, diurnal), and that are important for characterizing soil functions and ecological processes and for predicting soil behavior.

**Use-dependant properties**: Soil properties that change in response to use and management of the soil. These include soil organic matter levels and aggregate stability.

**Use-invariant properties**: Soil properties that change little if at all among different land uses. They include mineralogy, texture, and depth to bedrock.

Other terms related to dynamic soil properties include: Management-dependent properties, near-surface properties

The need for dynamic soil properties information is not just for data but for a better understanding of the processes of how soils change. Some of these processes include:

- Effects of management on soil
- Effects of natural disturbance on soil
- Effects of climate change on soil
- Ecological processes
- Plant-soil interactions
- Diurnal and seasonal variation in soil properties

We need to educate and involve customers and partners so they can help define needs and possible solutions.

# Soil Science Activity at SUNY ESF

In order to provide you with a summary of soils related activity at SUNY College of Environmental Science and Forestry (SUNY ESF), I would like to provide you with a brief description of the courses offered, as well as current research.

A number of soil science courses are offered and I teach most of them. Those courses are listed below. This limited selection allows interested students to obtain the 12 credit hours necessary to qualify as a potential employee with the NRCS. A copy of the course syllabus for each of these courses is attached in the appendix.

✦
- **3 credit hour course consisting of lecture + lab (6 field, 6 in-door lab)**

✦
- **3 credit hour course consisting of lecture + 1 weekend field trip**

✦
- **3 credit hour course consisting of lecture for the first 2/3 of the spring semester, followed by a field soil mapping exercise for the remaining 1/3 of the semester**

✦
- **3 credit hour course consisting of lecture and 2 field trips**

✦
- **3 credit hour course consisting of lecture supplemented with take home problems. This course is avialable at Syracuse University and is taught by a colleague.**

Next I will provide a brief summary of my research activities and those of my close colleagues. This represents a small selection of current work and is not meant to be an all inclusive list. However, it should provide you with some indication of the range of activities that a few of us are involved with at SUNY ESF.

## Current Projects (Briggs)

- 
  - Eric Young, Ph.D. student
- 
  - to determine effectiveness of 30' buffers (grass alone, grass + willow) in maintaining quality of water draining from agricultural fields

## Harvesting Impacts, Ripton VT

- 
  - Lauchlin Groff, Joshua Lemon, M.S. candidates
- 
  - to determine differential effects of whole-tree and tree-length harvesting on longterm site productivity as indicated by vegetation development

## Impacts of Short Rotation Intensive Culture on Soil Organic Matter

- 
  - Francis Ulzen-Appiah, Ph.D. candidate
- 
  - to determine if soil C (microbial biomass C; Sa Si Cl size fraction C) are affected by:

## Christmas Tree Fertilization

- 
- 
  - to determine fertilizer application guidelines for successful response of Douglas-fir, balsam fir, concolor fir, and Frazer fir to N fertilization

✦

**Current Projects (Briggs)**

✦

– **Eric Young, Ph.D. student**

✦

– **Francis Ulzen-Appiah, Ph.D. candidate**

✦

✦

**Dr. Chris Nowak**

✦

– **Determine effects of vegetation management, site quality & land use history on shrub community growth and development across New York**

– **Ben Ballard, Ph.D. candidate**

**Dr. Chris Nowak**

✦

– **Determine the effects of microsite and soil conditions on survival, early growth of clonal willow & poplar**

– **Bryon Sallidin, MS candidate**

**Dr. Chris Nowak**

✦

– **Determine temporal patterns of surface-soil, exchangeable K in an aggrading system**

– **Katie Moller, MS candidate**

**Current Projects (Yanai)**

✦

✦

**Current Projects (Yanai)**

✦

✦

**Pending Projects (Yanai)**

✦

✦

# Using Soil Surveys for Site Assessments in the Adirondack Park

**Brian Grisi, Adirondack Park Agency**
**Raybrook, NY**

**Soil Survey Status in 12 County <u>Region of the Adirondack Park</u>**

## <u>Soil Survey Issues</u>

## <u>Soil Survey Solutions</u>

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## National Soil Survey Center Priorities

**Carolyn Olson, NSSC**

### NSSC Priorities

* Soil Survey Manual Revision
* Use-Dependent / Dynamic Soil Properties
* Agricultural Handbook 296 Revision
* Re-Engineering Standard Soil Survey Interpretations Criteria
* Data Population Algorithms - NASIS
* Soil Geomorphology - Soil Science Institute Course
* Soil P Benchmark Project

### Soil Survey Manual Revision

* Improve logical arrangement -- step-wise approach to mapping soils
* Incorporate new material
  - Investigative techniques
  - Interpretations
  - Data management
* Expand introductory material in current Chapter 1
* Revisit definitions of terms: e.g. Ksat and permeability

### Use-Dependent / Dynamic Soil Properties

* Goal -- develop and implement collection, storage, and presentation of data
* Initial Report -- assessment of current situation
* Conduct literature reviews, test frameworks for collecting and organizing data
* Work with clients and cooperators to determine kind of data needed
* Conduct field studies to test models and data collection methods

### Ag Handbook 296 Revision -- LRRs and MLRAs

* Compilation of national map of LRRs and MLRAs with a narrative of each region and area at a scale of 1:7,500,000 (update from 1965 and 1981 editions)
* Draft of narrative by end of FY 2003
* Map drafts -- first versions are now available, in review with NRI

## Interpretation Criteria

* Phase 1: Capability to generate interpretive ratings in NASIS introduced 1997
* Phase 2: NASIS interpretations generator --
  re-evaluation of process used for providing soil survey interpretations has begun in 2002
* Review and evaluate present interpretative criteria
* Choose 2-3 interpretations as prototypes in 2002

## Interpretation Criteria

* Upcoming years - additional interpretations will be examined based on these results
* Interpretations Criteria Committee for NSSC - Chair: Scheyer
* Soil Data Viewer - web based design; extending use: e.g. assist golf course design & construction

## Data Population Algorithms

* Priority -- to produce algorithms for data elements needed by national agricultural programs and coordinate these with national releases
  _ Provide information for predictive models e.g. RUSLE2, WEQ, MMP

  _ Development of models to facilitate populating data elements in NASIS

## Data Population Algorithms

* Status:
  _ 1/3 bar, 1/10 bar -- developing documentation
  _ Atterberg Limits -- documentation completed

- _ Bulk Density -- documentation to be completed; default values if regular method not applicable
- _ Unified and AASHTO systems -- validation of changes to algorithms
- _ Null values -- 'not rated'; implementation mid-August

## Soil Geomorphology

* Revitalization of research activities and literature from the Soil Geomorphology projects of the
  1960 - 1970's
  - _ **Desert Project in New Mexico**
  - _ **Willamette Valley in Oregon**
  - _ **North Carolina Project (Coastal Plain and Piedmont)**
  - _ **Iowa Project (Glaciated and Non-glaciated**)
* Implementation: Soil Science Institute II
* Identify geographic areas for future long-term intensive studies

## Additional Activities

* Application of magnetic susceptibility to identify hydric soil boundaries (joint study with UNL)
* 20 Taxonomy proposals available for review comment
* Two International Taxonomy Committees
  ICOMANTH - Chair, John Galbraith, VPI&SU
  ICOMMOTR - Chair, Wayne Hudnall, LSU

## Additional Activities

* Thermic / Hyperthermic Soil Temperature Study in progress
* Update or issue new NSSC technical notes - e.g. Soil Color Contrast
* National Soil Interpretations Advisory Group - teams NRCS state, field and NCSS cooperators
* National Soil Technical Services Committee

## Additional Activities

Phosphorus:

* Summarize related research on the behavior and transport of P in soils and agroecosystems

* Continue using benchmark soils to evaluate analytical methods for measuring P
* In cooperative studies, conduct field experiments to assess P runoff

## Additional Activities

* NSSC hosts International Visitors
  _ Fulbright Scholar -- Dr. Sergey Goryachkin
  _ Spanish Fellowship - Carlos Monteverde
* 2003 Soil Survey Division Theme -- Environmental Risks and Hazards

## Additional Activities

* Geophysics Assistance - GPR and EMI
* Soil Climate Program
* Carbon Sequestration

Agriculture and Agri-Food Canada   Agriculture et Agroalimentaire Canada

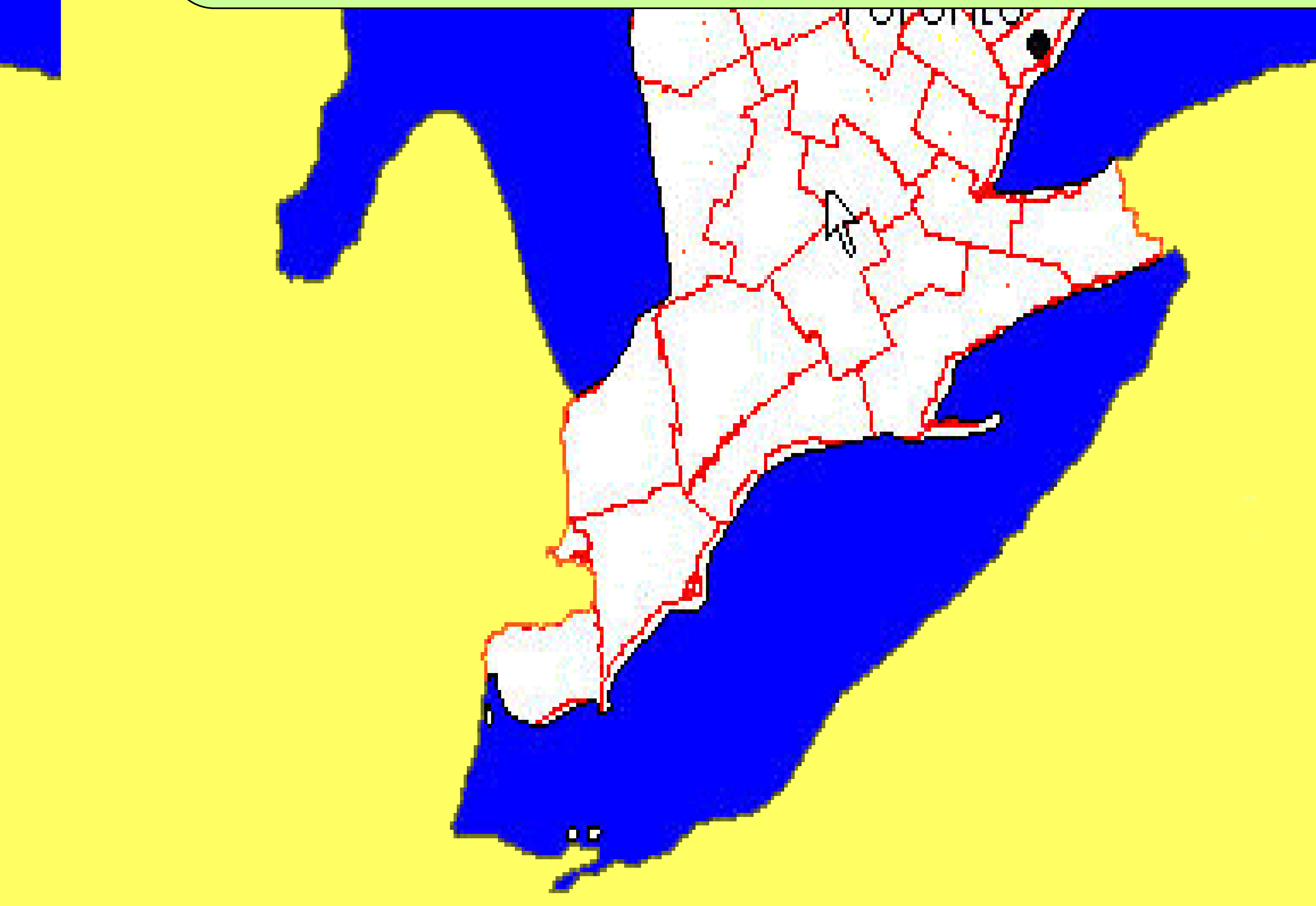
# Soils Ontario

**David Kroetsch**
**Agriculture and Agri-Fo**
**Eastern Cereal and Oils**
**960 Carling Ave.**
**Ottawa, ON. CA**
**kroetschd@agr.gc.ca**

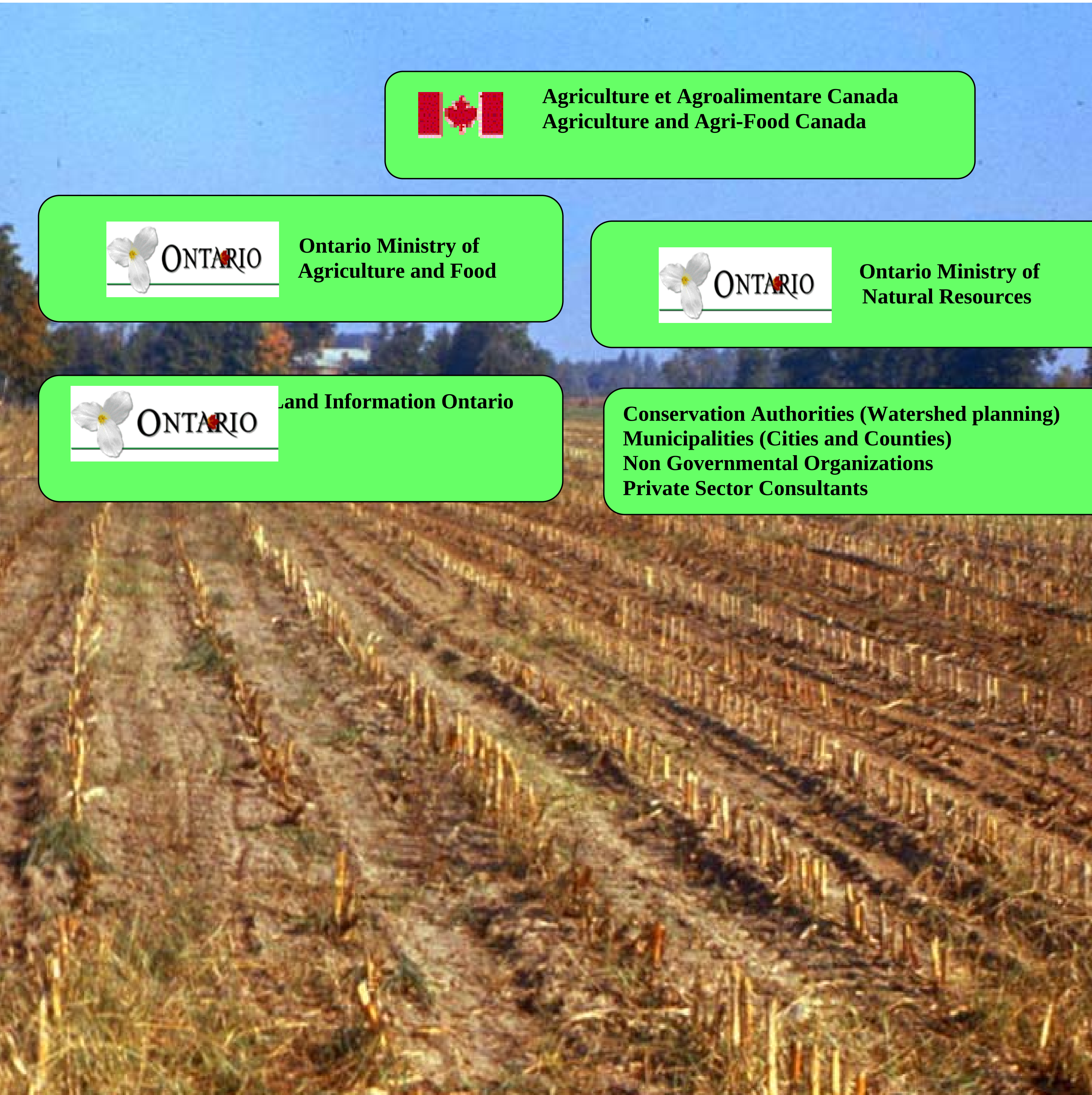
**Agricultural land base of Ontario**
- 1981 - 14.9 million acres
- 1996 - 13.8 million acres
- loss of 7.4%

**Quantity and Quality of the agricultural land resource impacted by**
1) urban and rural development interface pressures
2) agricultural intensification
3) water quality and quantity demands
4) climate change

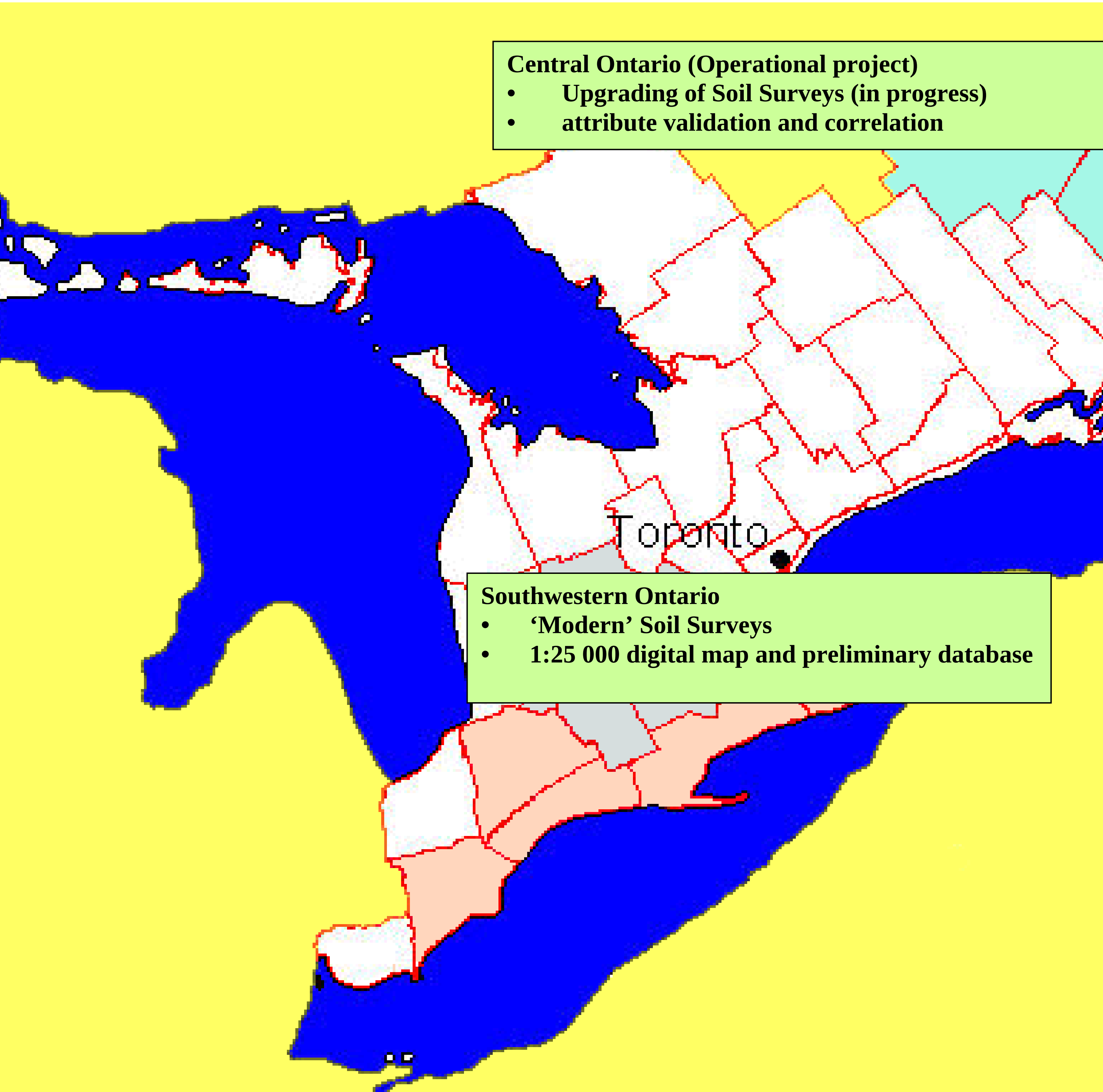
**Accurate soil classification and mapping is critical for:**
- municipal and provincial land use planning
- identification of sensitive ecological areas-Ecological Land Classification
- water shed planning - ground and surface water protection
- soil capability for agriculture



# SOILS ONTARIO Partnership



**Eastern Ontario (Pilot Research Area)**
- Upgraded Soil Surveys
- 1:50 000 seamless digital map and database




**Central Ontario (Operational project)**
- Upgrading of Soil Surveys (in progress)
- attribute validation and correlation

**Southwestern Ontario**
- 'Modern' Soil Surveys
- 1:25 000 digital map and preliminary database

**Phase 1: Build Soil Framework**

- georeference to a common base (Ontario Base Map Series) and 'digitally stitch together' 35 Southern Ontario Counties
- automate data structure

**Phase 2: Application of Update Methodology**

- validate existing map and data attributes, define and implement data standards
- apply slope analysis and calculate slope classes (from DEM) where applicable
- verification of automated slope and soil analysis through field verification
- map boundary, soil attribute and field correlation

**Phase 3: Validation and Distribution of 'SEAMLESS' Soil Map for Ontario**

- systematic checking of map boundaries and attributes
- select field validation
- uploading of SOILS ONTARIO into Land Information Ontario (LIO) Warehouse

# Soil Survey Upgrade

# Parallel Projects

**Ontario Soil Landscape Attribute Project (OSLAP)**

- systematic stratified georeferenced pedon sampling of Cate (series) in Ontario

**Soil Landscapes of Canada (SLC) – new version**

- 1:1 million map and database for Canada
- line and attribute revision to version 3.0
- coordinated national stratified and georeferenced pedon sampling

# SOILS ONTARIO

# Partners in Improving Soil Information in Ontario

# Marketing Soil Survey

**by Gary Muckel, National Soil Survey Center**

## SELLING SOILS
State NCSS Partnerships

- Provide soil information and services in-state
- Train potential users of soil survey information
- Put soil information
  to use through marketing

## SOIL SURVEY DIVISION
Building alliances with potential users of soil survey information
Passive Marketing Creates Image

**Goal**

## Active Marketing
Focused effort
Customer involvement
Supports goals
Organized with a plan

***Where are we going with marketing??***

2001 - Science teachers

- **GOAL**
    - **ACTIONS**

– **National Science Teachers convention and PLT**
– **soil biology primer**
– **soil biology planner**
– **textbook reviews**
– **“Dig In” book**
– **bookmarks, soil color poster, soil order map**
– **soil science education Web site and CD**

2002 - Land managers & consultants

- **GOAL**
    - **ACTIONS**

– **liaison to agricultural groups**
– **expand materials for soil quality**
– **expand on-line products**
– **maps, planner, Web information**
– **increase accessible soil information**
– **train in use of Soil Data Viewer**

2003 - Land use planners & contractors

- **GOAL**
    - **ACTIONS**

– **liaison to homebuilders & contractors**
– **info on flooding, compaction, shrink-swell, and other risks and hazards to minimize losses**
– **identify construction hazards**
– **info on how to minimize impact on soils**

## 2004 - Wildland managers

- **GOAL**

- **ACTIONS**

– **ecological sites**
– **soil-vegetation relationships**
– **endangered species**
– **special interpretations for rangeland, military use, forests, parks**
– **visitor center materials, stories for interpreters**

## 2005 - Land Policy Leadership

- **GOAL**
- **ACTIONS**

– **soil carbon maps**
– **world soil maps**
– **prepare tours**
– **prepare for 2006 Internat'l Congress**

## MARKETING IS NOTHING MORE THAN

Key Soil Messages for Marketing

KEY SOIL MESSAGES

- Soil is a fundamental part of the ecosystem
- Pedology, the study of soil, is a unique discipline
- Soil survey is unbiased and scientifically based
- Soils perform several vital functions
- Soils are variable (23,000 series) but predictable

KEY SOIL MESSAGES

- Scientific names for soils should be used
- Soil studies can be incorporated into other studies
- Consider the soil first to minimize risk
- Soils are alive
- Soil management affects soil properties

# Hydropedology: Bridging Disciplines, Scales, and Data

**Henry Lin**

**The Pennsylvania State University**

**Slide #1:**
Title: Hydropedology – Bridging disciplines, scales, and data. I would go through each of the three briefly.

**Slide #2:**
I suggest that hydropedology may be defined as an intertwined branch of soil science and hydrology that embraces interdisciplinary – highlighted here are 3 cornerstones, pedology, soil physics, and hydrology – and multiscale approaches – from macroscopic down to microscopic – for the study of interactive pedologic and hydrologic processes and properties in the earth's critical zone. The critical zone, as defined by the NRC, extends through the root zone, deep vadose zone, and ground water zone. Interactions at this interface between the solid earth and its fluid envelopes determine the availability of nearly every life-sustaining resource.

Horizontally, hydropedology connects the pedon and the landscape paradigms, and addresses soil and water issues across a range of spatial and temporal scales.

**Slide #3:**
Here is a conceptual diagram further illustrating the relationships of hydropedology to other related disciplines such as geomorphology, hydrogeology, and other branches of soil science.

**Slide #4:**
What are the knowledge gaps that would benefit from the integration of classical pedology and soil physics/hydrology? Besides the scaling and data issues to be discussed in a few minutes, highlighted here are just some topics that I think would need "hydropedological" approach to enhance our understanding of landscape-oriented flow and transport processes and mechanisms controlling individual and interactive soil-water processes.

- *Soil structure quantification:* We need ways of representing soil natural "architecture" in a manner that can be coupled into models of flow, scaling, and rate processes. Currently, quantification of soil structure and its impact on flow and transport in field soils remain unresolved.
- *Preferential flow prediction*: Our ability to determine and predict preferential flow dynamics, velocity, pathway, its significance in different soils, and its interface with soil matrix is unsatisfactory. Quantitative relationships between preferential flow and soil texture/structure/layering could provide a means of predicting *a priori* how important preferential flow is in a given soil (especially when linked to soil map units).

- *Soil hydromorphology modeling*: Soil macro- and micro-morphology has long been used to infer soil moisture, hydraulic properties, and to provide a basis for soil genesis and classification. However, quantitative use and modeling of soil morphology have been lacking.
- *Water movement in the landscape*: "Where, when, and how" water moves through various landscapes and how water flow impacts soil processes and subsequently soil spatial patterns are yet to be better understood. Conceptual models of water movement in the landscape would likely go beyond the classical Darcy-Buckingham's laws for the saturated and unsaturated flow.
- *Soil variation*: One major frustrating issue facing soil scientists, hydrologists, and alike in dealing with the variably-unsaturated zone, both in terms of experimentation and modeling, is the overwhelming heterogeneity of the subsurface. Both pedologists and soil physicists/hydrologists have made tremendous efforts in understanding and modeling soil variation, but their efforts did not seem to have converged well in the past.

**Slide #5:**
Here is an illustration of hydropedology functioning as a bridge among pedology, soil physics, and hydrology. Three general scales of microscopic, mesoscopic, and macroscopic levels are illustrated in hierarchical frameworks for soil structure (pedology), preferential flow (soil physics), and water quality (hydrology).

**Slide #6:**
In terms of multiscale bridging from microscopic (e.g., pore- and aggregate-scales) to mesoscopic (e.g., pedon- and catena-scales) and to macroscopic levels (e.g., watershed-, regional-, and global-scales), here is an analog to the leaf – tree – forest relationship.

It is apparent that when the sample size is changed from small soil cores to field plots, we need to incorporate soil structural information and the concept of representative elementary volume (REV). When the sample size is further enlarged from field plots to watersheds, we need to consider the variation in topography, land use, and the concept of representative elementary area (REA). Nevertheless, scale transfer or multiscale bridging issue remains at the heart of many hydrologic and pedologic studies.

**Slide #7:**
Here are two conceptual frameworks that may help multiscale bridging in hydropedology: the hierarchies of soil mapping (for soil distribution) and soil modeling (for soil process). The hierarchy of soil mapping relates to the spatial distribution of soil types or specific soil properties over landscapes of varying sizes through different orders of soil surveys, spatial interpolation, and/or spatial aggregation. The hierarchy of soil modeling relates to the representation of soil processes at different scales and the upscaling or downscaling of model input parameters.

**Slide #8:**
"Data rich, information poor" has been a common syndrome in many disciplines. (Information here connotes interpretation, synthesis, and utilization of data.)

In soil science and hydrology, it is recognized that gaps exist between what we have (e.g., the National Cooperative Soil Survey databases) and what we need (e.g., soil hydraulic parameters needed for simulation models).

Improved procedures to extract useful information from the available databases and to improve/interpret soil survey data for flow and transport characteristics in different soils are needed.

**Slide #9:**
With increasing popularity of using GIS coupled with vadose zone models and soil survey databases for diverse environmental and natural resource applications, the demand for soil hydraulic properties has increased significantly in recent years. Existing methods for direct field measurement of soil hydraulic properties remain complex, time-consuming, and costly.

This has prompted efforts to indirectly estimate soil hydraulic properties using more readily available data often found in soil surveys (such as particle-size distribution, bulk density, organic matter content, and others). Such indirect methods, now often referred to as pedotransfer functions (PTFs), have been attempted for estimating various soil hydraulic parameters.

While various degrees of success have been achieved with different PTFs, limitations of existing PTFs remain. For example, the vast majority of the existing PTFs are completely empirical, and the existing PTFs have not yet fully incorporated soil structure and land use information, and have lacked scale and temporal considerations.

In the mean time, the NCSS databases developed over the last century may have been underused in the growing concerns about environmental issues. Interpretations and applications of the NCSS databases are challenges facing soil scientists in general and pedologists in particular. There are pressures on both pedologists and soil physicist/hydrologists to get the soil survey information out and utilize in a variety of applications.

**Slide #10:**
The combined efforts of pedologists and soil physicists/hydrologists could open up new opportunities for the next generation of PTFs. For instance, five general categories of PTFs may be identified for potential improvement in estimating dynamic soil properties.

PTF Type I relates use-dependent soil properties to soil hydraulic information, both of dynamic nature requiring regular sampling.

PTF II includes relatively static soil properties that could be sampled only once.

PTF III considers soil mapping and classification related information to improve the prediction.

Landscape features such as DEM, land use/land cover, and others could serve as additional inputs to PTFs (PTF IV and V), hence connecting the pedon and the landscape scales.

**Slide #11:**
It is hopeful that hydropedology would contribute to our enhanced understanding of a variety of environmental, ecological, agricultural, and natural resource issues of societal importance, such as soil and water quality, watershed processes, nutrient cycling, contaminant fate, waste disposal, precision agriculture, climate change, and ecosystem functions.

Illustrated here is contaminant-related hydropedology applications: As many releases of contaminants to the subsurface occur within or above the vadose zone, hydropedologists play a critical role in the integrated study of contaminant fate in the environment.

**Slide #12:**
To summarize up my presentation:

There is a growing recognition that synergy could be generated by bridging traditional pedology with soil physics and hydrology to enhance integrative studies of soil-water relationships across spatial and temporal scales.

Hydropedology is suggested as such a bridge that addresses: 1) knowledge gaps between pedology and soil physics/hydrology; 2) multiscale bridging from microscopic to mesoscopic and to macroscopic levels; and 3) data translations from soil survey databases into soil hydraulic information.

**The bridging of disciplines, scales, and data represents potentially unique contributions of hydropedology to integrative soil and water sciences.**

While the scope, specific contents, and niche areas of hydropedology need to be further defined and accepted by soil science and hydrology communities, I believe the bridging of disciplines, scales, and data is important in the development of synergistic and integrative hydropedology.

Recognizing hydropedology also enhances the education of the next generation of soil scientists and vadose zone hydrologists since education in the 21st century emphasizes interdisciplinarity.

## Soil Survey Division Activities

# Northeast Cooperative Soil Survey Conference

Maxine Levin
National Program Manager, Soil Survey Division
Natural Resources Conservation Service-USDA
Washington, DC
June 27, 2002

**"... I cannot conceive of the time when knowledge of soils will be complete. Our expectation is that our successors will build on what has been done, as we are building on the work of our predecessors."**

**--- R. S. Smith, Director of the Illinois Soil Survey, 1928**

**NCSS Key Issues**

- **1st generation Soil Maps on 2 billion acres nationwide**

**—replacement cost $5,000,000,000**

- **Soil mapping delivered electronically must have a certified database from NASIS.**

**------Only 1/3 of the nation is certified at this time.**

- **Tremendous demand for new Soil Survey Products: electronic surveys on CD-ROM or Web, interactive (GIS based) soil surveys, new & improved interpretations, use dependent data**
- **Functional soil data warehouse**
- **At present mapping rate of 25 million acres a year, a survey finished today won't be updated for 90 years**
- **At present publication rate, a survey published today won't be republished for more than 70 years**
- **New and emerging technology to increase productivity and efficiency of soil survey**
- **Training---**

  **Landscape Analysis, GIS, Geophysical Techniques**
- **Soil Survey staffing and succession—NRCS and NCSS partners must maintain a field staff of 1000-1100 soil scientists nationwide.**
- **Estimated 50% of the current staff ready to retire in 5 years--replacement and training is a critical issue.**

**Soil Survey Division Activities-Focus for 2002-2003**

- **Support & leadership for NCSS Infrastructure**
- **Interpretation & distribution of soil information for the USDA implementation of Farm Bill**
  - **Electronic databases (spatial & attribute soil data )**

_ **Interpretations**
_ **Field support**
l **New technology to increase production and efficiency**

**Soil Survey Division-Investment for the Future**
l **Refresh workforce**
l **Support & Promote the MLRA Concept**
l **New Technology**
l **Market & Package what we've got to attract new funding support**

**NCSS Soil Scientist training --best available**
" **Soil Science Institute**
" **National Soil Survey Center**
" **MLRA workshops**
" **Land Grant Universities & Cooperative Extension**
" **Can training sessions be opened to private sector?**
**Where is our future workforce?**
" **Universities need students**
" **Numbers of undergraduate soil science majors low**
  - **Jobs are available**
  - **New partnerships**
  - **Science majors from urban junior colleges**
  - **Grad degrees for other science majors**

**Recruitment and Retention of Soil Scientists**
- **With the Farm Bill, Career Intern Program is now available**
- **Summer recruitment and hiring through Land Judging collegiate teams**

# Remarks

Many thanks to the following individuals for their hard work and contributions to making this a very successful conference:

**Northeast Cooperative Soil Survey Conference Steering Committee**

Tyrone Goddard/Co-chair
Steve DeGloria/Co-chair
Carolyn Olson
James Baker
David Kris

**Local Planning Committee**

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